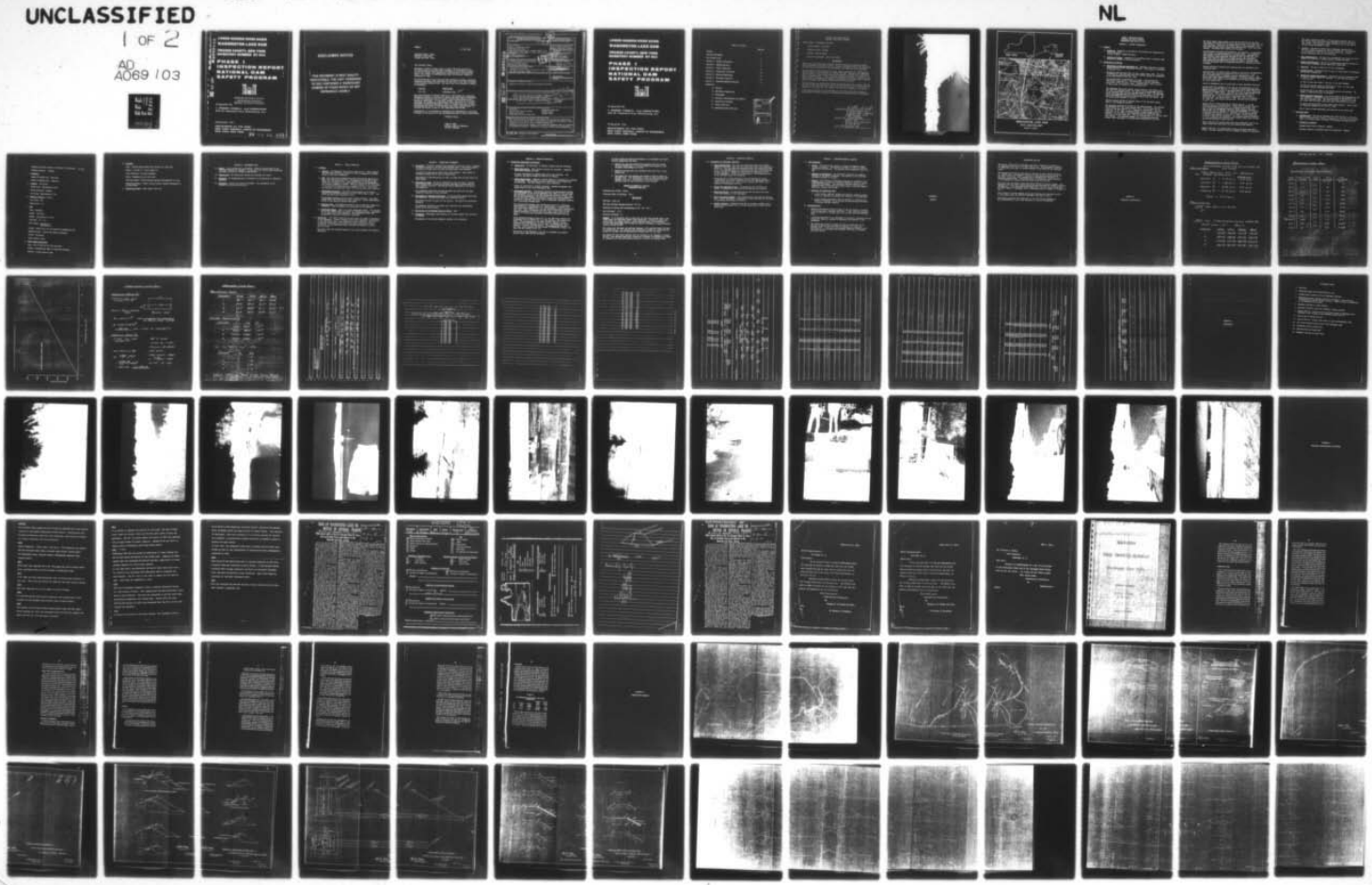
AD-A069 103 KIMBALL (L ROBERT) AND ASSOCIATES EBENSBURG PA F/G 13/2
NATIONAL DAM SAFETY PROGRAM. WASHINGTON LAKE DAM (INVENTORY NUM--ETC(U)
SEP 78 R J KIMBALL DACW51-78-C-0025

UNCLASSIFIED NL

1 OF 2

AD A069 103



AD A069103

DDC FILE COPY

LOWER HUDSON RIVER BASIN
WASHINGTON LAKE DAM

ORANGE COUNTY, NEW YORK
INVENTORY NUMBER NY 603

PHASE 1
INSPECTION REPORT
NATIONAL DAM
SAFETY PROGRAM

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED

CONTRACT NO. DACW-51-78-C-0025

Prepared by

L. ROBERT KIMBALL and ASSOCIATES
615 W. Highland Ave. Ebensburg, Pa.

Prepared For

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

79 05 29 067

DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DDC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

NANEN-P

12 OCT 1978

Honorable Hugh L. Carey
Governor of New York
Albany, New York 12224

Dear Governor Carey:

Reference is made to letter dated 2 October 1978 hand delivered to Mr. George Koch of New York State Department of Environmental Conservation on 3 October 1978 regarding a clarification of the guidelines used by this office in assessing dams under the National Program of Inspection of Dams.

The following dam in your state has been assessed as having a seriously inadequate spillway, with capability to pass safely less than 50 percent of the probable maximum flood. The dam is now to be assessed as unsafe, non-emergency:

I.D. NO.	NAME OF DAM
N.Y. 603	Washington Lake

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

Consequently, it is advisable to implement the recommendations previously furnished in the reports for the above-mentioned dam as soon as practicable.

Sincerely yours,

CLARK H. BENN
Colonel, Corps of Engineers
District Engineer

AD A069103

DDC FILE COPY

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): Phase I Inspection Report Washington Lake Dam Lower Hudson River Basin, Orange County, N.Y. Inventory No. N.Y. 603	5. TYPE OF REPORT & PERIOD COVERED: Phase I Inspection Report National Dam Safety Program 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): R. Jeffrey Kimball, P.E.	8. CONTRACT OR GRANT NUMBER(s): DACW-51-78-C-0025
9. PERFORMING ORGANIZATION NAME AND ADDRESS: L. Robert Kimball and Associates 615 W. Highland Avenue Ebensburg, Pennsylvania	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 12 / 114p.
11. CONTROLLING OFFICE NAME AND ADDRESS: Department of the Army 26 Federal Plaza / New York District, CofE New York, New York 10007	12. REPORT DATE: 29 Sept[illegible] 1978 13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; Distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

(b) National Dam Safety Program. Washington Lake Dam (Inventory Number NY-603), Lower Hudson River Basin, Orange County, New York. Phase 1 Inspection Report.

DDC RECEIVED MAY 30 1979 DISTRIBUTION C

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Washington Lake Dam
Orange County
Natural Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Washington Lake Dam was judged to be unsafe-non emergency due to a seriously inadequate spillway. Additional follow-up studies were recommended.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

411059

LOWER HUDSON RIVER BASIN

WASHINGTON LAKE DAM

ORANGE COUNTY, NEW YORK
INVENTORY NUMBER NY 603

PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

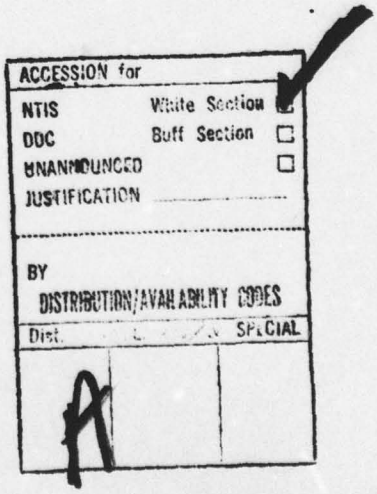
Prepared by

L. ROBERT KIMBALL and ASSOCIATES
615 W. Highland Ave. Ebensburg, Pa.

Prepared For

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

Table of Contents



PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Washington Lake Dam

State Located: New York

County Located: Orange

Stream: Natural Basin

Date of Inspection: August 28, 1978

ASSESSMENT

The visual inspection and evaluation did not reveal any conditions which require immediate emergency action. However, followup studies are necessary to evaluate the stability of the embankment and adequacy of the spillway.

The hydrologic study conducted for this report indicated that the spillway and reservoir are not adequate to control the PMF. However, the complexity of the structure made accurate evaluation impractical under the scope of a Phase I Investigation. A more detailed hydrologic analysis is needed in the near future to determine the degree of inadequacy of the hydrologic controls and to determine what spillway modifications are necessary.

In the interim, the flashboards should be removed from the low level weir to maintain a low reservoir level and the entire spillway crest width should be lowered to elevation 301, the same as the low level opening, if practical.

A thorough evaluation of the embankment is necessary including drilling, testing and stability analysis to determine the condition of the embankment.

Submitted by: R. Jeffrey Kimball

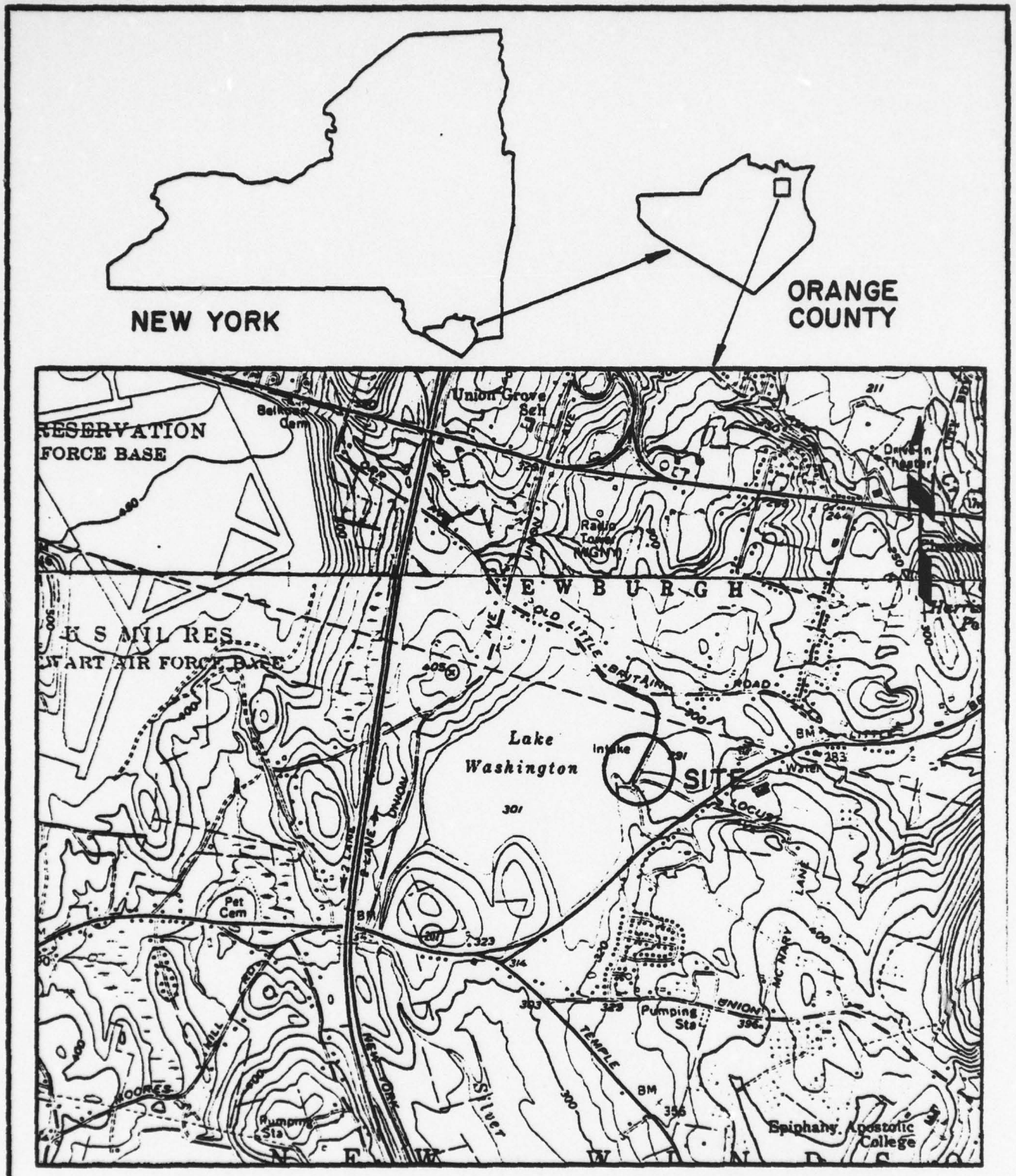
R. Jeffrey Kimball, P.E.
L. ROBERT KIMBALL & ASSOCIATES
Registration No. 26275E

Approved by:

CLARK H. BENN
Colonel, Corps of Engineers
District Engineer

Date: 29 Sept 78

OVERVIEW OF UPSTREAM SLOPE
FROM RIGHT ABUTMENT



WASHINGTON LAKE DAM

SITE LOCATION MAP

SCALE: 1"=2000'

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
WASHINGTON LAKE DAM ID # 603

SECTION 1: PROJECT INFORMATION

1.1 General:

a. Authority: Authority is provided by the National Dam Inspection Act Public Law 92-367.
Contract Number: DACW51-78-C-0025

b. Purpose of Project: Evaluation of non-Federal dams to identify dams which are a threat to life and property.

1.2 Description of Project:

a. Description of Dam and Appurtenances: Washington Lake Dam is a water supply structure with considerable history. The history is presented in section 1.2 g.

— Washington Lake has been used for water supply since 1852. The lake is located in a natural basin with the outflow through an underground cavern approximately 4600 feet long.

The existing dam is approximately 30' high. The upstream and downstream slopes are 2:1. The embankment is heavily vegetated with grass, brush and small trees. Lockwood Basin, which consists of small pond, is located at the downstream toe.

The embankment has an odd shaped, nearly vertical, clay puddle core wall near the upstream slope. The puddle core was extended parallel to the upstream slope when the dam was raised in 1909. The upstream slope and downstream toe are protected with hand placed rip rap. The dam is approximately 2300 feet long and curves near the center. The top width varies between 12' and 15'.

Outflow through the dam is through either of the two water supply pipes or the emergency spillway.

The emergency spillway is located at the right abutment. The spillway is controlled by a two level concrete weir. The low level at the center of the weir section is 4' long and 15 inches deep. The top level weir is 16' long. A wooden bridge on steel beams crosses the spillway. At the time of the inspection a wooden flashboard was inserted in the low level weir. The spillway approach is a concrete paved open channel. The discharge channel is a curving, concrete, open channel which discharges to Lockwood Basin downstream of the dam.

The water supply lines consist of one 30 inch and one 24 inch line. The intake is controlled in the gate house located in the lake near the right abutment. There are two intake levels on the structure. The gate house contains manual screw type controls with a cross over pipe between. The inlets are protected with screens.

Two additional structures are located in the reservoir. An abandoned filter house is located adjacent to the gate house. The remains of the original control structure are located near the upstream slope. This structure controlled flow through two 16" cast iron pipes which were cased in concrete and passed through the original dam. These pipes were extended when the dam was raised. The gate house has been demolished and the remaining structure is leaning and nearly collapsed.

Several additional controls and structures must be considered with Washington Lake.

Lockwood Basin is a natural pool, located at the toe of the Washington Dam, which was raised by installation of an outlet weir. Flow out of Lockwood Basin is through a natural underground cavern. The basin water level remains fairly constant. An inlet structure located in the pool allows water to be withdrawn from the basin through the 24" water supply line.

Inflow to Washington Lake is controlled by three upstream structures.

Located 1500 feet southwest of the lake at the intersection of I-87 and NY 207 is Control Gate No. 1. The gate controls flow from Silver Stream directing it either to Washington Lake or to Silver Stream and eventually the Hudson River. The gate is a steel frame housing three sluice gates. Flow from the gates is under State Road 207 to Washington Lake. With the gates closed normal flow returns to Silver Stream. The gates control a small pool which is formed by a 15' high, 97' long concrete gravity dam. The pool can be drained by an 8" line.

Browns Pond is located upstream of Control Gate No. 1 on the upstream reaches of Silver Stream. Browns Pond is formed partially by an earthen dam and partially by a concrete gravity dam. The pond is part of the Newburgh reservoir system. Normal discharge from Browns Pond is through a 48" pipe that discharges to a natural stream above Control Gate No.1. Overflow from the dam is through a concrete open channel 31' wide and 5' deep. A brief inspection of Brown's Pond dam was conducted. The concrete structure appeared to be in relatively poor condition with several seeps noted through the dam and apparently under the dam.

Major overflows from Browns Pond would enter Washington Lake if the Control Gates were open until the flow exceeds gate capacity.

Control Gate No. 3 is located 2000' north of the lake along Union Avenue. The gate controls flow in an unnamed tributary to the north.

The control structure houses a 48" gate which controls flow to a box culvert which eventually enters Washington Lake at the northwest corner. With the gate closed overflow is out of the side of the gate house bypassing the lake.

b. Location: The dam is located west of Newburgh, Orange County, New York between Interstate 87 and State Route 207. The location of the dam can be found on the Cornwall, New York, 7.5 minute series quadrangle (See site location map).

c. Size Classification: The dam is an intermediate size structure with a height of 30 feet and a storage capacity of 6,600 acre-feet.

d. Hazard Classification: The dam is a high hazard potential structure with several buildings located immediately downstream.

e. Ownership: The dam is owned by the City of Newburgh.

f. Purpose of Dam: Washington Lake is used for water supply for Newburgh and adjacent communities.

g. Design and Construction History: Washington Lake was originally used in 1852 as a water supply for Newburgh. At the time the lake was a natural pond.

In 1892 the dam was raised 5' and part of the lake dredged.

In 1909 the dam was raised an additional 5.7 feet. At this time the present control structures were built.

Cross-sections of the 1909 to 1912 modifications are available. No design or construction data is available.

h. Normal Operation Procedures: The dam is operated and maintained by the city personnel. Presently the dam is operated at approximately two feet below spillway level. The diversion gates upstream of the dam are closed when the water level goes above the present water level.

All gates are excercised at least three times annually. Water supply is alternated between the 30" and 24" lines.

Due to lack of funds maintenance has been lax in the recent past.

1.3 Pertinent Data:

a. Drainage Area: The natural drainage area above the dam is relatively small (.69 square miles), however, diversions to the lake from adjacent areas (4.93 square miles) increases the drainage area significantly.

b. Discharge at Damsite:

Maximum Known Flood at Damsite: Unknown

Spillway Capacity at Maximum Design Pool Elevation: Unknown

Emergency Spillway Capacity at Maximum Pool Elevation: 471 cfs

Maximum Tailwater: Unknown

c. Reservoir:

Length of Normal Pool: 3900 feet

Length of Maximum Pool: 4000 feet

d. Storage: (acre-feet)

Normal Pool: Approximately 6,600

Design Surcharge: Unknown

Top of Dam: Approximately 7,371

e. Reservoir Surface: (acres)

Top of Dam: 190

Normal Pool: 175

f. Dam:

Type: Earthfill

Length: 2300 feet

Height: Approximately 30 feet

Top Width: 12' - 15'

Side Slopes: Upstream 2:1
Downstream 2:1

Zoning: Puddle core, rip rap zones with homogeneous fill

Impervious Core: Puddle core shown on drawings

Cutoff: None known

Grout Curtain: None

g. Water Supply Facilities:

Type: One 24" and one 30" cast iron pipe

Length: Approximately 3000' to filtration building

Closure: At gate house in lake

h. Spillway:

Type: Concrete open channel with concrete two level weir

Length: Low weir 4' - total length 16'

Crest Elevation: 301 feet estimated

Gates: Flashboard in low level weir

Upstream Channel: Paved concrete approach approximately 30' long

Downstream Channel: Paved, curving concrete channel discharging to Lockwood Basin.

i. Regulating Outlets: Water supply lines only

SECTION 2: ENGINEERING DATA

2.1 Design: Little design data is available. Several cross-sections on the 1909 modifications are available. No details on the outlet works, materials, hydrology, stability or seepage investigations.

2.2 Construction: No construction records are available for review.

2.3 Operation: No engineering data is available on the operation or operating equipment.

2.4 Evaluation: Little or no data is available. The information is not adequate is evaluate the structure.

SECTION 3: VISUAL INSPECTION

3.1 Findings:

a. General: The Washington Lake Dam was inspected by L. Robert Kimball and Associates personnel on August 28, 1978, accompanied by Richard Pascoe of the City of Newburgh.

b. Dam: The crest and the downstream slopes were heavily vegetated and made close inspection difficult. The vegetation consisted of high grass, ivy, and small trees. Close examination of the downstream slope was not conducted. Lockwood Basin is located at the downstream toe creating permanent tailwater. The head between the two reservoirs at the time of the inspection was estimated at 8 feet. Both slopes are steep and no erosion was noted. The rip rap was in good condition.

c. Appurtenant Structures: The outlet works appeared to be in good condition and operated frequently (at least three times a year). New valves and gates were installed in 1974.

The emergency spillway and crest were in good condition. The outlet channel walls and bottom were in good condition. Little deterioration of any of the concrete surfaces were noted.

d. Reservoir Area: The immediate reservoir area is partially rimmed with vegetation. Some development has taken place in the watershed.

e. Downstream Channel: There is no real downstream channel. The drainage out of the Lockwood Basin is through an underground cavern. Eventually all drainage flows toward Newburgh. The drainage way 5,000 feet downstream is moderately sloping and developed.

3.2 Evaluation: The visual inspection did not reveal any signs of instability on the embankment. However, because of the heavy vegetation, particularly on the downstream slope, close examination was not possible. The city of Newburgh representative indicated that during seasons when visual observation of the downstream slope is possible no seepage or erosion was ever noted.

The outlet works and spillway appears to be in good condition and operated adequately.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures: The dam is operated and maintained by the city staff. Presently the dam is operated at two feet below spillway level. The diversion gates upstream are closed, when the lake level goes above this elevation.

All gates are exercised at least three times annually. Water supply is alternated between the 30" and 24" supply lines.

Approximately 5,000,000 gallons of water are taken from the lake daily for water supply.

4.2 Maintenance of Dam: The dam is maintained by the city staff. However, due to recent lack of funds and personnel shortages no maintenance has been conducted this year. The dam was heavily vegetated at the time of the inspection.

City personnel report that the dam was mowed last year and a thorough inspection conducted by city personnel.

4.3 Maintenance of Operating Facilities: In 1974 the water supply gate house was renovated. The gates and stems were completely worked.

Maintenance records are kept for the controls. The valves are excercised regularly.

The emergency spillway is in fairly poor condition with considerable growth in the outlet channel.

4.4 Description of Any Warning System in Effect: None

4.5 Evaluation: Maintenance and operation of the water supply inlet structure is adequate.

Maintenance of the dam and emergency spillway is not adequate.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Hydrologic Evaluation of Features:

a. Design Data: No hydrologic or hydraulic design data was available.

b. Experience Record: Some rainfall records are available. Reservoir water level records are kept.

No exact information on maximum known flood was available. The reservoir was nearly drained in 1954 due to drought.

c. Visual Observations: Emergency outflow should be considered only through the spillway. The spillway is partly obstructed by the bridge over the structure. The exit channel is in poor condition.

Inflow is controlled at several locations. Maximum discharges from Browns Pond will not enter Washington Lake

d. Overtopping Analysis: Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and subsequent routing of the PMF through the reservoir system. The PMF is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration losses, and concentration of run-off at a specific location, that is considered reasonably possible for a particular drainage area.

The uncontrolled drainage area contributing directly to Washington Lake Reservoir is approximately 0.7 square miles. To develop the basic hydrologic working tool, the unit hydrograph, Snyder Coefficients were used. After discussions with the Corps of Engineers personnel assumed parameters of Cp=0.60 and Ct=2.0 were used, a value of Tp equal to 1.31 hours was calculated considering watershed size and shape.

Using Hydrometeorological Report No. 33, the PMF index rainfall was determined to be 21 inches for a 24 hour duration, 200 square mile basin. The percentages of the index rainfall applied to other durations were interpolated from the plot of drainage area versus percent of 24 hour, 200 square mile. The computed PMF flow was 2153 cfs. After routing the PMF through the impounded storage, the peak flow was reduced to 697 cfs.

The ability of the Washington Lake Dam to discharge the standard project flood (SPF) was not evaluated.

To allow inflow and outflow hydrographs to be developed and routed several assumptions were made:

1. Inflow only from the uncontrolled drainage area was allowed. The flow through Gate 1 to the southwest and the gate to the northwest were assumed to be zero.

2. Elevation storage data was calculated from the U.S.G.S. topographic map.

3. The bridge over the spillway was assumed to have no affect on spillway flow. The flashboards in the low level overflow were assumed to be out. The reservoir level was assumed to be at spillway level at the initiation of flood routing.

SUMMARY OF HYDROLOGIC ANALYSIS
WASHINGTON LAKE DAM

Elevation Top of Dam: 305.25

Elevation Crest of Spillway: 301.0

PMF ROUTING

PMF Peak: 2153 cfs

PMF After Routing through Reservoir 697 cfs

Elevation of Routed PMF Corresponding to 697 cfs: 305.4

Dam Overtopped: 0.15'

Spillway Surcharge: 4.4'

Comment: It is estimated that at least 220 cfs base flow through Gates 1 and 3 will enter the Lake under normal flood conditions. Failure of either gate could result in a higher inflow. A more detailed study of the hydrology of this area considering flow through the gates is necessary to assure adequate controls during the PMF.

This study also evaluated the spillway assuming a full spillway width (16 feet) at elevation 301.0. The reservoir and spillway are capable of controlling the runoff for the PMF from the uncontrolled drainage area for this case.

The results of this study indicate that the spillway is not adequate to control the PMF. More detailed hydrologic studies are necessary to determine the degree of inadequacy and the modifications necessary to control the design flood.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability:

a. Visual Observations: The crest and downstream slopes were heavily vegetated with small trees and tall grass which made close examination difficult. Both upstream and downstream slopes were moderately steep (2:1). The upstream slope was covered with rip rap in good condition. No major erosion or seepage was observed where vegetation did not obscure embankment. Erosion or undercutting of the downstream slope at the tailwater level was unobserved.

During periods of large discharges from the spillway may create a significant rise on the tailwater level if the underground cavern cannot control this flow. This rise in tailwater may affect the stability of Washington Lake Dam.

b. Design and Construction Data: No design data was available for reveiw. In addition, no construction information was availalbe.

c. Operating Records: No operating records were available that would affect the stability of the embankment.

d. Post Construction Changes: Major modifications were made in 1892 and 1909. Little information is available on these modifications including on information pertaining to stability.

e. Seismic Stability: Washington Lake Dam is located in seismic zone 1. Seismic activity should not be a factor unless static conditions are unfavorable.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment:

a. Safety: This dam does not appear to present an immediate danger to life or property. The dam does not appear to have any serious operational deficiencies. The spillway is not adequate to pass the PMF.

b. Adequacy of Information: The information available for complete analysis of the dam is inadequate. The validity of the available information appears to be good.

c. Urgency: The condition of Washington Lake Dam is considered to be a non-emergency situation not requiring immediate action to protect downstream development. The hydrologic analysis indicated that remedial action is necessary in the near future to provide adequate hydrologic controls for the PMF.

d. Necessity for Additional Work:

1. A test boring, sampling, testing and stability analysis program should be conducted to evaluate the stability of the embankment.

2. A more detailed hydrologic study is necessary to determine the degree of inadequacy of the spillway and modifications necessary to increase spillway capacity.

7.2 Recommendations:

1. Remedial modifications should be made in the near future to increase storm storage and/or spillway capacities. A more detailed hydrologic study is necessary to consider the flow from the controlled drainage areas.

2. A thorough evaluation of the embankment is necessary, including drilling, testing and stability analysis to determine the condition of the embankment.

3. The flashboards should be removed from the low level weir in the spillway to assure that the reservoir remains at or below the spillway level. If practical the spillway should be widened to the full width at the low level weir elevation (301 feet) to increase spillway capacity.

APPENDIX A

GEOLOGY

WASHINGTON LAKE DAM

The bedrock underlying the Washington Lake Dam is composed of dolostone of the Wappinger Group which is of Upper Cambria age. The Normanskill Formation, of middle Ordivician age, is located adjacent to and underlies the Wappinger Group.

The Wappinger dolostone was deposited to the east of their present position, in a stable shelf environment. During the Green Mountain Anticlinorium, of the middle ordovician, rapid accumulation of sediments were deposited in a deepening eugeosyncline. Interbedded layers of graywackes, shales and silts of the Normanskill Formation were deposited during this period.

The strate was then highly folded and faulted during the Taconic Orogeny. The Wappinger Group and other related formations were thrusted over younger formations (Normanskill). This thrusting formed nappes which now have mostly eroded away. The small remnant of Wappinger Group at Washington Lake is evidence of evidence of this.

Later during the Acadian Ogogeny and Triassic Periods more faulting occurred, at the present time, the area near Washington Lake Dam is stable.

Pleistonene glaciation has eroded much of the area and has blanketed it with accumulations of clay, sand and gravel of various thickenesses.

APPENDIX B

HYDROLOGIC COMPUTATIONS

WASHINGTON LAKE DAM

NOTE SUBAREAS 2,3,4 WERE NOT CONSIDERED FOR THIS STUDY

DRAINAGE AREA

FROM CORNWALL, N.Y. AND NEWBURGH, N.Y. USGS QUADRANGLES.

		IMPERVIOUS
SUBAREA 1	= 0.70 SQ. MI.	0.31 SQ. MI.
SUBAREA 2	= 1.90 SQ. MI.	0.31 SQ. MI.
SUBAREA 3	= 2.43 SQ. MI.	0.0 SQ. MI.
SUBAREA 4	= 2.74 SQ. MI.	0.0 SQ. MI.

TOTAL = 7.77 SQ. MI.

PRECIPITATION

SPF FROM EM 1110-2-1411

10"

PMF FROM HYDROMETEOROLOGICAL REPORT 33.

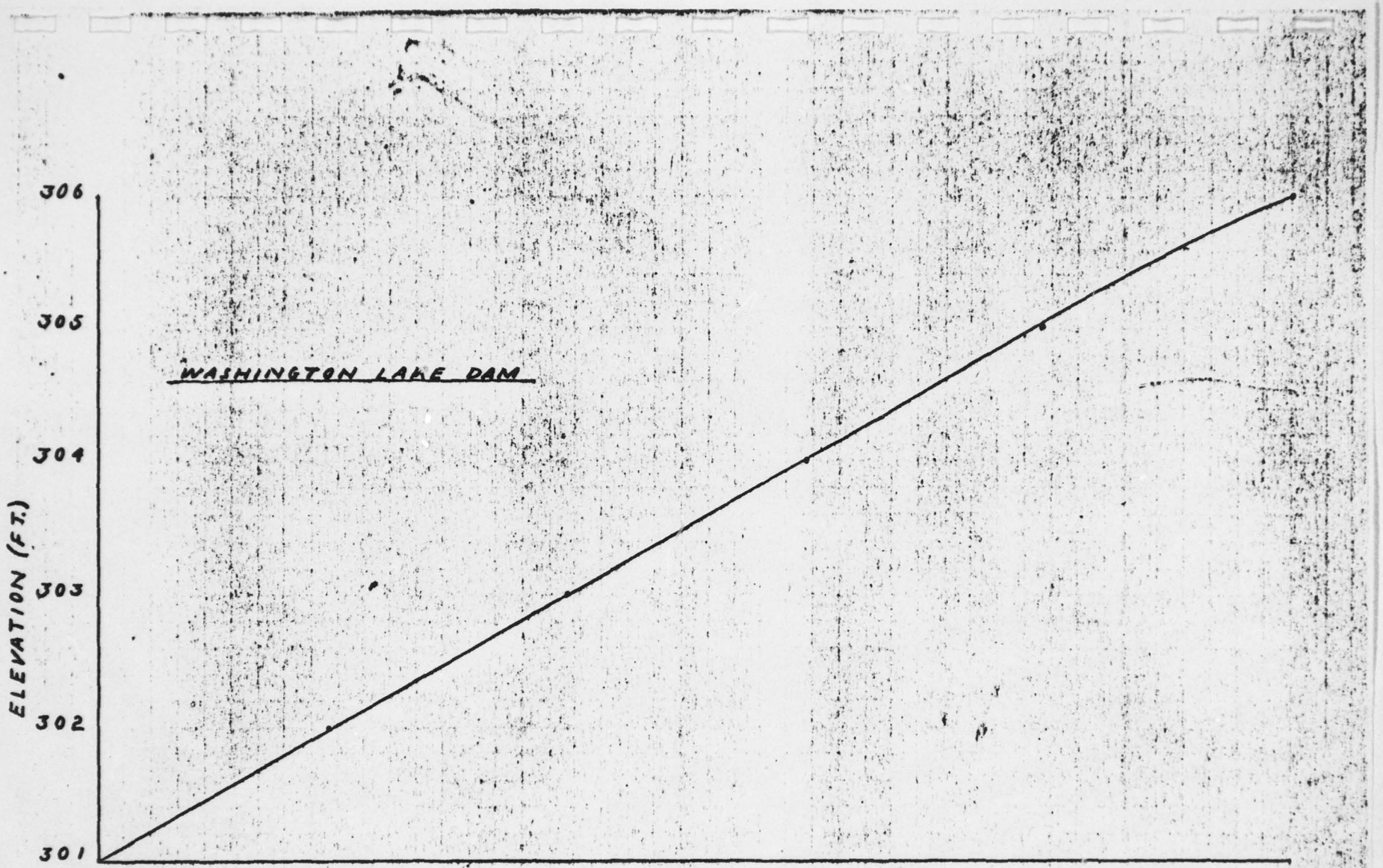
PMP INDEX = 21" ZONE 1

SUBAREA	6 HR.	12 HR.	24 HR	48 HR
1	136.5%	146.0%	157.5%	170.5%
2	129.5%	139.5%	151.0%	163.0%
3	127.0%	137.0%	148.0%	160.0%
4	125.5%	136.0%	147.0%	159.5%

WASHINGTON LAKE DAM

ELEVATION - STORAGE RELATIONSHIP

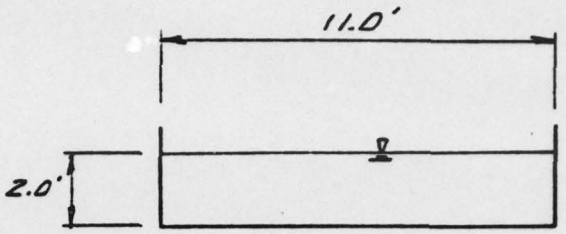
ELEV. (FT.)	SURFACE AREA (ACRES)	ΔELEV. (FT.)	TOTAL STORAGE (AC.-FT.)	TOTAL DISCHARGE (CFS)
301.0	175		0	0
		0.5		
301.5	176		88	19
		0.5		
302.0	177		176	53
		0.5		
302.5	178		265	97
		0.5		
303.0	179		354	149
		0.5		
303.5	180		444	209
		0.5		
304.0	181		534	274
		0.5		
304.5	182		625	346
		0.5		
305.0	183		716	422
		0.3		
TOP FOAM 305.3	183.6		771	471
		0.2		
305.5	184		808	1045
		0.5		
306.0	185		900	4133


WASHINGTON LAKE DAM
306
305
304
303
302
301
ELEVATION (FT.)
0
1
2
3
4
5
6
7
8
9
STORAGE (AC.-FT.) x 10²

WASHINGTON LAKE DAM

CAPACITY GATE #1

CONTROLS FLOW FROM SUBAREAS #2 & #3



ASSUME BROAD-CRESTED WEIR

BREADTH = 8.6'

$Q = 2.64\ L H^{3/2}$ FROM HANDBOOK OF HYDRAULICS BY BRATER & KING p.5-40

$Q = 2.64 (11.0)(2)^{3/2}$

$= 82$ c.f.s. MAX. INFLOW TO SUBAREA #1

CAPACITY GATE #3

CONTROLS FLOW FROM SUBAREA #4

48" ϕ GATE

INVERT EL. = 321'

SPILLWAY EL. 302.25'

∴ $\Delta h = 18.75'$

APPROX. LENGTH = 2000'

$S = 18.75/2000 = .0094$

$d = 4.0'$ $n = .013$

FROM MANNING'S EQ.:

$$Q = \frac{0.463}{n} d^{8/3} S^{1/2}$$

$$= \frac{0.463}{.013} (4)^{8/3} (.0094)^{1/2}$$

$= 139$ c.f.s. SAY 140 c.f.s.

WASHINGTON LAKE DAM

PRECIPITATION (CONT.)

SUBAREA	6 HR.	12 HR.	24 HR.	48 HR.
1	28.7"	30.7"	33.1"	35.8"
2	27.2"	29.3"	31.7"	34.2"
3	26.7"	28.8"	31.1"	33.6"
4	26.4"	28.6"	30.9"	33.3"

SNYDER COEFFICIENTS

SUBAREA	L	L_{ca}	C_t
1	5350'	3000'	1.47*
2	8250'	2850'	1.47*
3	10,300'	6000'	1.47*
4	13,800'	6850'	1.47*

$$t_{pR} = C_t (.955)(L \cdot L_{ca})^{.3} + .25 t_R$$

SUBAREA	t_R	t_{pR}
1	.5	1.31
2	.5	1.46
3	.5	1.94
4	.5	2.15

$640 C_p = 439$*

$C_p = 0.69$

*REFER: LOWER HUDSON REPORT BY CORPS OF ENGINEERS

****
HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01
****

LAKE WASHINGTON DAM
RESERVOIR AT SPILLWAY ELEVATION
PMF PRECIPITATION

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	30	0	0	0	0	1	0	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

SUBAREA 1 HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
101	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	0.70	0.0	0.70	0.0	0.0	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	21.00	136.50	146.00	157.50	170.50	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.680

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP

0.0 0.0 1.00 0.0 0.0 1.00 2.20 0.13 0.0 0.44

UNIT HYDROGRAPH DATA

TP 1.31 CP 0.69 NTA 0

RECESSION DATA

STRTQ 10.00 QRCSN -0.51 RTIOR 4.12

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC 3.11 AND R 1.97 INTERVALS

UNIT HYDROGRAPH 12 END-OF-PERIOD ORDINATES. LAG 1.31 HOURS. CP 0.69 VOL 1.00

47. 156. 227. 190. 115. 68. 41. 24. 14. 9.
5. 3.

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.00	0.00	9.
2	0.00	0.00	8.
3	0.00	0.00	7.
4	0.00	0.00	7.
5	0.00	0.00	6.
6	0.00	0.00	6.
7	0.00	0.00	5.
8	0.00	0.00	5.
9	0.00	0.00	5.
10	0.00	0.00	4.
11	0.00	0.00	4.
12	0.00	0.00	4.
13	0.01	0.00	3.
14	0.01	0.00	4.
15	0.01	0.00	4.
16	0.01	0.00	4.
17	0.01	0.00	4.
18	0.01	0.00	4.
19	0.01	0.00	4.
20	0.01	0.00	4.
21	0.01	0.00	4.

22	0.01	0.00	4.
23	0.01	0.00	4.
24	0.01	0.00	4.
25	0.08	0.04	5.
26	0.08	0.04	10.
27	0.10	0.04	18.
28	0.10	0.04	25.
29	0.12	0.05	30.
30	0.12	0.05	35.
31	0.31	0.13	44.
32	0.31	0.13	60.
33	0.11	0.05	76.
34	0.11	0.05	79.
35	0.09	0.04	70.
36	0.09	0.04	58.
37	0.01	0.00	48.
38	0.01	0.00	38.
39	0.01	0.00	33.
40	0.01	0.00	29.
41	0.01	0.00	25.
42	0.01	0.00	22.
43	0.01	0.00	19.
44	0.01	0.00	16.
45	0.01	0.00	14.
46	0.01	0.00	12.
47	0.01	0.00	11.
48	0.01	0.00	9.
49	0.05	0.02	8.
50	0.05	0.02	7.
51	0.05	0.02	12.
52	0.05	0.02	16.
53	0.05	0.02	18.
54	0.05	0.02	20.
55	0.05	0.02	20.
56	0.05	0.02	21.
57	0.05	0.02	21.

58	0.05	0.02	21.
59	0.05	0.02	22.
60	0.05	0.02	22.
61	0.11	0.08	24.
62	0.11	0.08	32.
63	0.11	0.08	44.
64	0.11	0.08	54.
65	0.11	0.08	60.
66	0.11	0.08	64.
67	0.11	0.08	66.
68	0.11	0.08	67.
69	0.11	0.08	68.
70	0.11	0.08	68.
71	0.11	0.08	69.
72	0.11	0.08	69.
73	0.97	0.94	109.
74	0.97	0.94	244.
75	1.17	1.13	448.
76	1.17	1.13	642.
77	1.46	1.42	799.
78	1.46	1.42	940.
79	3.70	3.66	1169.
80	3.70	3.66	1608.
81	1.36	1.33	2060.
82	1.36	1.33	2153.
83	1.07	1.04	1385.
84	1.07	1.04	1560.
85	0.08	0.05	1275.
86	0.08	0.05	1035.
87	0.08	0.05	898.
88	0.08	0.05	780.
89	0.08	0.05	677.
90	0.08	0.05	588.
91	0.08	0.05	510.
92	0.08	0.05	443.
93	0.08	0.05	384.

MOORE CLEAN PRINT® NO. 3016-3091-3 429-827 141310 11" PRINTED IN USA

94	0.08	0.05	333.
95	0.08	0.05	289.
96	0.08	0.05	251.
97	0.0	0.0	218.
98	0.0	0.0	189.
99	0.0	0.0	164.
100	0.0	0.0	143.
SUM	24.20	21.54	23590.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2153.	1347.	472.	236.	23595.
INCHES		17.90	25.08	26.13	26.13
AC-FT		668.	936.	975.	975.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
100	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

0.	221.	354.	444.	534.	625.	716.	770.	900.	0.
0.	18.	63.	108.	160.	220.	286.	322.	4365.	0.

TIME	EOP STOR	AVG IN	EOP OUT
1	108.	9.	9.
2	108.	8.	9.
3	108.	8.	9.

4	108.	7.	9.
5	108.	7.	9.
6	107.	6.	9.
7	107.	6.	9.
8	107.	5.	9.
9	107.	5.	9.
10	107.	4.	9.
11	107.	4.	9.
12	106.	4.	9.
13	106.	4.	9.
14	106.	4.	9.
15	106.	4.	9.
16	106.	4.	9.
17	105.	4.	9.
18	105.	4.	9.
19	105.	4.	9.
20	105.	4.	9.
21	105.	4.	9.
22	104.	4.	9.
23	104.	4.	8.
24	104.	4.	8.
25	104.	5.	8.
26	104.	8.	8.
27	104.	14.	8.
28	105.	21.	9.
29	105.	28.	9.
30	106.	33.	9.
31	108.	40.	9.
32	110.	52.	9.
33	112.	68.	9.
34	115.	78.	9.
35	117.	75.	10.
36	120.	64.	10.
37	121.	53.	10.
38	123.	43.	10.
39	124.	36.	10.

40	125.	31.	10.
41	126.	27.	10.
42	126.	24.	10.
43	126.	20.	10.
44	127.	18.	10.
45	127.	15.	10.
46	127.	13.	10.
47	127.	12.	10.
48	127.	10.	10.
49	127.	9.	10.
50	127.	8.	10.
51	127.	9.	10.
52	127.	14.	10.
53	127.	17.	10.
54	128.	19.	10.
55	128.	20.	10.
56	129.	21.	10.
57	129.	21.	11.
58	129.	21.	11.
59	130.	22.	11.
60	130.	22.	11.
61	131.	23.	11.
62	132.	28.	11.
63	133.	38.	11.
64	134.	49.	11.
65	136.	57.	11.
66	138.	62.	11.
67	140.	65.	11.
68	143.	67.	12.
69	145.	68.	12.
70	147.	68.	12.
71	150.	69.	12.
72	152.	69.	12.
73	155.	89.	13.
74	162.	177.	13.
75	176.	346.	14.

MOORE CLEAN PRINT - HO 3,016,305; 3,429,627 1412TQ 11" PRINTED IN USA

76	198.	545.	16.	
77	227.	720.	20.	
78	261.	869.	32.	
79	303.	1055.	46.	
80	359.	1389.	65.	
81	431.	1834.	101.	
82	513.	2106.	148.	
83	589.	2019.	196.	
84	651.	1722.	239.	
85	699.	1417.	274.	
86	735.	1155.	299.	
87	762.	967.	317.	
88	778.	839.	584.	
89	782.	728.	697.	
90	780.	632.	646.	
91	778.	549.	570.	
92	776.	476.	497.	
93	774.	413.	432.	
94	772.	359.	375.	
95	770.	311.	325.	
96	768.	270.	321.	
97	764.	235.	318.	
98	760.	204.	315.	
99	754.	177.	311.	
100	748.	153.	307.	
SUM			8190.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	697.	450.	161.	82.	8190.
INCHES		5.98	8.54	9.07	9.07
AC-FT		223.	319.	339.	339.

***** ********** ********** ********** **********

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	101	2159.	1347.	472.	236.	0.70
ROUTED TO	100	697.	450.	161.	82.	0.70

APPENDIX C

PHOTOGRAPHS

Photograph Index

1. Dam crest.
2. Downstream slope with Lockwood Basin at toe.
3. Lockwood Basin located at toe of Washington Lake Dam.
4. Abandoned principal spillway control in foreground. Left structure in background is the new intake structure. Right structure in background is the abandoned filter plant.
5. Emergency spillway at right abutment.
6. Emergency spillway crest with flashboard looking upstream.
7. Control Gate #1 - Controls flow from Silver Stream to Washington Lake. Building to left of gate is the abandoned Control Gate #1.
8. Gravity Dam at Control Gate #1.
9. Control Gate #3 - Directs flow toward or away from Washington Lake..
10. Box culvert between Control Gate #3 and Washington Lake.
11. Downstream slope of Browns Pond.
12. Upstream slope of Browns Pond.
13. Emergency spillway at Browns Pond.

Photo 1

Photo 2

Photo 3

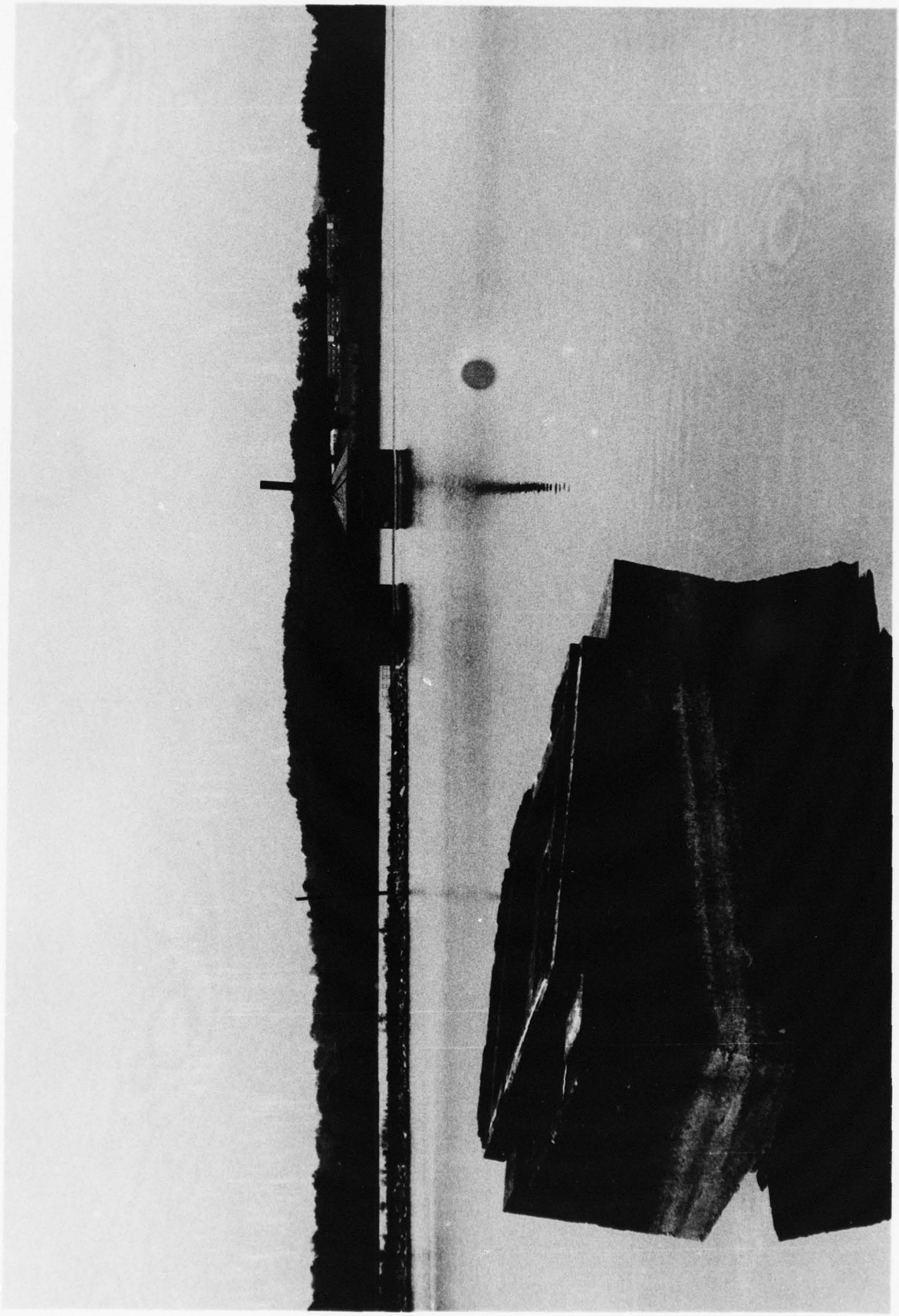


Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

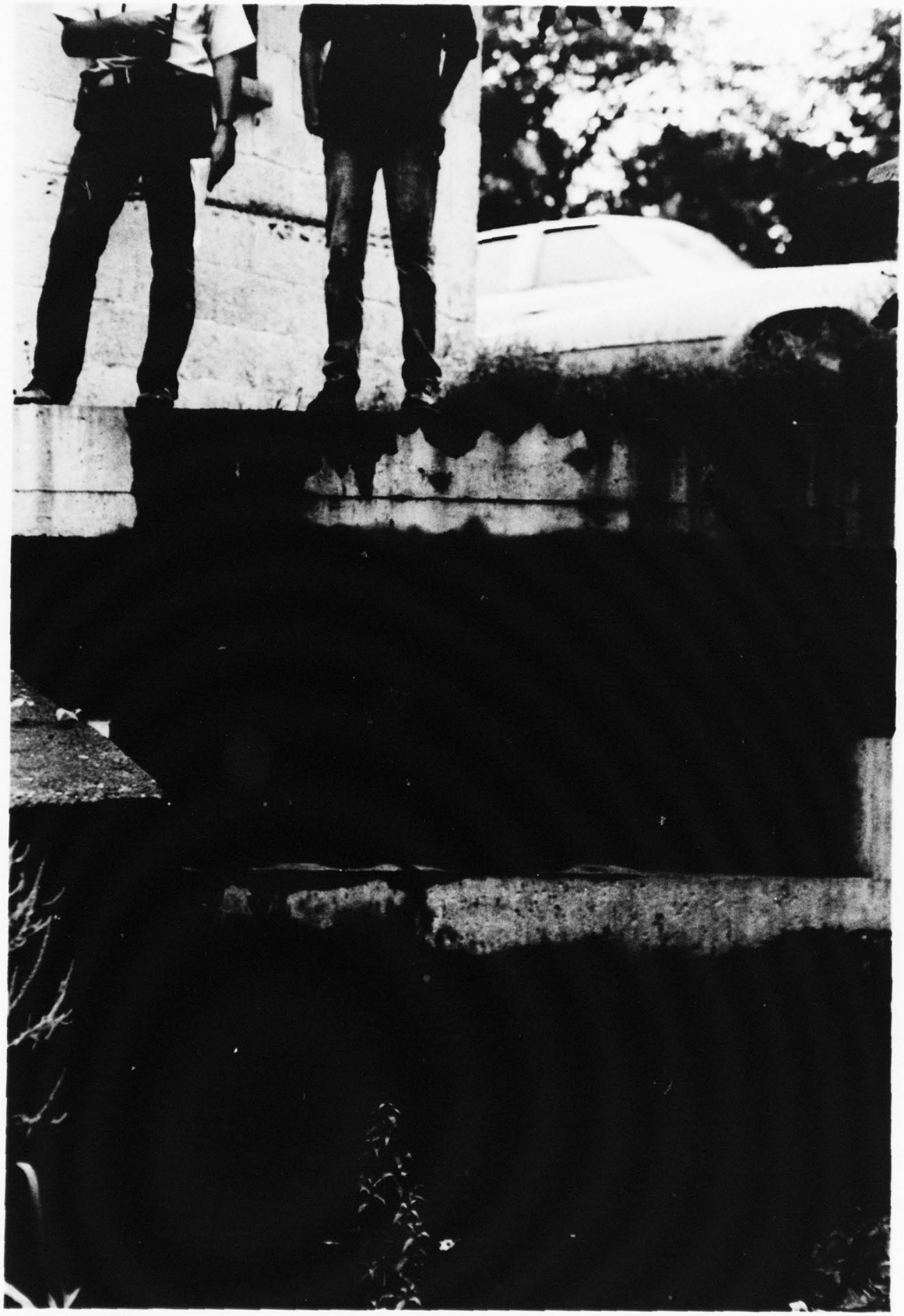


Photo 9

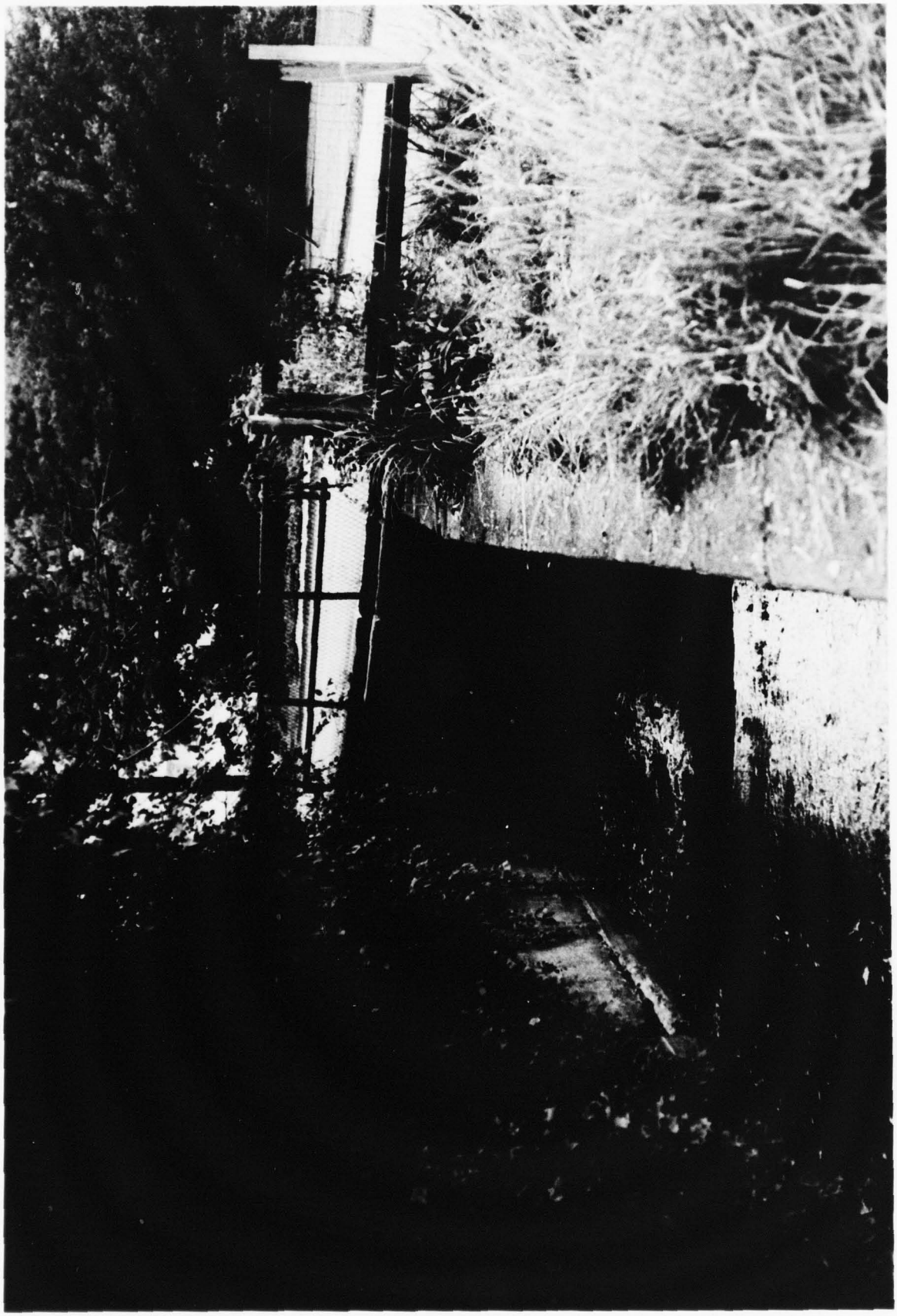


Photo 10

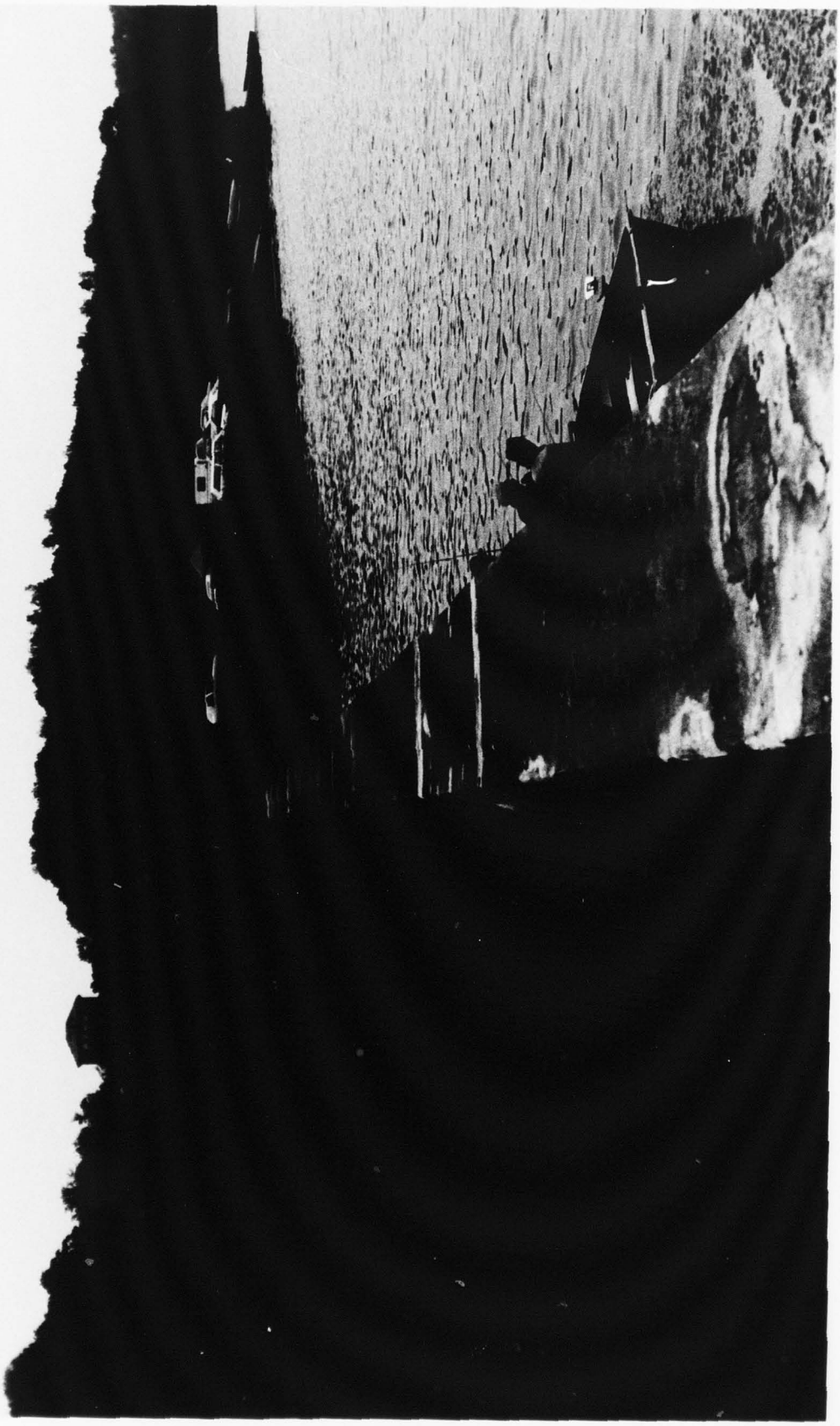


Photo 11

Photo 12

Photo 13

APPENDIX D

PERTINENT CORRESPONDENCE AND REPORTS

HISTORY

The original water supply of the Village of Newburgh was "Cold Spring" located at the present Washington Street School. Distribution was through hollowed-out logs with iron couplings, with masonry cisterns at various locations for fire protection.

1853

Monell Reservoir, "Trout Hole", was built. The reservoir was spring fed and utilized water from a natural pond called "Little Pond", now Washington Lake, through natural underground channels from "Swallow Hole."

1887

More water was required and a 30" tile pipe was laid to bring water from a diversion dam on Silver Stream to Washington Lake.

1872

A 20" pipe was laid from Washington Lake to bring water directly to the City. This line now serves the feed for the high service system.

1874

The City acquired all of the rights to Silver Stream.

1886

A 1,600,000 gallon high service reservoir was constructed at the location of the present high service tank on Marne Avenue.

1887

The quality of the water became exceptionally poor and the underground passage of water was attempted again but did not improve the water and the 20" line was again utilized.

1892

In an effort to improve the quality of the water, the dam at Washington Lake was raised 5 feet and 200,000 cubic yards of muck was excavated. The 30" raw water supply line built in 1867 was replaced with an open trench of larger capacity. Murphy Ditch was built to supply water to Washington Lake from Patton Brook.

1907 - 1909

Washington Lake Dam was raised an additional 5.7 feet, making the dam 28 feet above the bottom of the intake pipe. Capacity at Washington Lake was increased 300,000,000 gallons, resulting in a total storage capacity of 1.08 billion gallons.

At the same time a new gatehouse and boiler house were built and a 30" service line installed from Washington Lake to Broadway and West Streets. The 30" line is now used to supply the low service area. This work was completed in 1912.

1918

The City of Newburgh taxpayers voted to acquire Plattekill Stream as a new source of water. This proposition had been previously voted down on two occasions. The plan was submitted to the New York State Conservation Commission and turned down. During 1918 and 1919, 680,000,000 gallons of water was purchased from the City of New York through the Aqueduct.

1912

Following the previous three year drought, the taxpayers voted to

build Brown's Pond Reservoir on Silver Stream and built the present Water Treatment Plant and Pump Station on Carter Street. The capacity of Washington Lake was increased to 1.2 billion gallons by raising the overflow; a one-half mile conduit was built on Murphy's Ditch to replace the open trench.

At this time, the taxpayers voted down a Diverson Dam on Drury Lane Stream as well as the installation of meters which were subsequently installed in 1936.

1954

Four miles of new mains were laid in various locations in the City. A service tank was installed on Ellis Avenue. A one million gallon filtered water storage reservoir was built at the Water Treatment Plant and main distribution lines installed. High level pump was installed at the Water Treatment Plant.

1965

The City obtained 620,000,000 gallons of water from the City of New York through a temporary tap.

DAM AT WASHINGTON LAKE TO SETTLE IN SEVERAL PLACES

Newburgh Register July 2, 1912

Water Board Asked to Pay For Damages Done By Overflow In Flooding Farm Lands Adjacent to the Reservoir and Silver Stream

As the result of the recent high water a part of the dam at Washington Lake was settled in several places, and steps were taken at the meeting of the Water Commissioners to remedy the condition. Contractor Patrick H. O'Hehir, of Warwick, who was engaged on the original work, has agreed to do the work on the unit basis under which his former work was paid for. He has not yet removed his machinery and tools, and President Turl brought the matter before the Board last evening in order that the work might to authorized before he did.

After a lengthy discussion, it was decided to direct City Engineer Blake to submit an estimate of the cost, owing to the condition of the Water Board's finances. The plan is to put crushed stone around the top of the dam, between Gretsinger's swamp and the gatehouse, to prevent a further washing away. It will cost considerably more to have the task performed in the future. It was said that had it not been for the settling of the dam hhere could have been four inches more water in the reservoir during the last few months.

Engineer Blake is to submit the estimate within ten days, after which a special meeting of the Board will be called to take action on it. Commissioner Wilson is against ordering the job at the present time as he does not see where the money is coming from. If O'Hehir takes his tools away the commissioners can get other bids when they are ready, he claims, and he is in favor of waiting until the water is low enough to see what the actual damage is.

Attorney Edward J. Collins appeared before the Board in the interests of William A. Clark, whose 76-acre farm adjoining Washington Lake is affected by the raising of the dam. Water backs up under the bridge of the road at that point and floods his grounds but the commissioners claim that part of the flooding is caused by a spring on the Clark property.

Regarding this feature of the case, Mr. Collins contends that a man has a right to flood his own property, but the point in question is just how much of the flooding the Water Board is responsible for. The flooding is not permanent, but continues from time to time. He asks that the condition be remedied or a financial settlement effected. The matter was referred to a committee composed of President Turl and Commissioner Brush, who will confer with Corporation Counsel Graham Witschief and Attorney Collins. Mr. Witschief has had photographs taken of the Clark flooding, and Engineer Blake is making a survey, which will be used in settling.

In a communication from Counsel Witschief, a notice was enclosed from Isaac N. Blanch, against whom proceedings were authorized at the last meeting of the Board, it being claimed that he was violating the state laws in connection with his premises along Silver Stream. During the annual inspection last month the Board reached an agreement with him whereby he was to remove a certain objectionable outhouse to a point indicated by the Board of Health. His damages were fixed at $15, and this amount was ordered paid to him if the inspector reports that the agreement has been carried out satisfactorily.

Attorney Witschief reported that he could find no liability on the part of the city in connection with the alleged flooding of lands owned by Isaac Calyer, near the Washington Lake dam, and that information in the case of Fred D. Calyer was insufficient for an opinion.

The attorney stated that he has procured the names of the owners of the Merritt and Stansbrough properties, also affected by the raising of the dam, and is in communication with them regarding a settlement.

Mr. Witschief reported that he thought there would be little trouble in coming to an agreement with J. W. D. Goodwin, whose sheep farm along Silver Stream is under consideration by the Board of Health. The difficulty arises by reason of the peculiar location to the stream, and the corporation ccunsel is going to have measurements taken, with a view of ascertaining the damage.

Commissioner Wilson reported the complaint of Bird W. Whitaker, of 77 Henry avenue, who is unable to get water above the first story in his home since the Washington Lake improvements. Assistant Superintendent Gilchrist was instructed to take the pressure at Clark street and Henry avenue and Lander street. It was said that it should be 45 points at those points, as it is 46 at Carson avenue.

There was a long-winded discussion on the advisability of allowing employees of the Board a vacation of two weeks, with pay, and it was finally passed by with no action at all. Commissioner Brush moved that the vacations be allowed, including the superintendent, assistant, the two engineers at Washington Lake, and the two helpers in the city. It was not seconded as the other members said they could not foresee the effect it would have on the public in general at this time, when the Board is entirely without funds

After standing all winter, water from the construction work of the Pittsburg Contracting Company, on the aqueduct, is to be emptied in the near future, according to the report of the watchman along Silver Stream. Superintendent Stanton was instructed to notify the gatekeeper to open the 16-inch gates when the water is emptied, which will allow it to go through into the pond without coming into the city mains.

A notice was read from City Clerk D. J. Coutant in which he recited the action of City Council on the upper Broadway improvement plan, requiring the Water Board to have all mains and supply pipes laid by September 1st. There is to be a connection at every 25-feet, although Superintendent Stanton was inclined to believe that such was not necessary, as there are places where no buildings will probably ever be put up.

It was stated that under the rules of the Board, property owners will have to pay for the connecting pipes where they are put in for the first time, but the Board must stand the expense of replacing old ones.

Newburgh Register
JUL 2 1912

To Miss Bennett
23 Jy 12

DAM INSPECTION REPORT
(By Visual Inspection)

Woodbury W.S.
Big = long

Dam Number	River Basin	Town	County	Hazard Class*	Date & Inspector
536	L. Hudson	New Windsor	Orange	C	9/18/74 KDH

Type of Construction

- [x] Earth w/concrete spillway
- [ ] Earth w/drop inlet pipe
- [ ] Earth w/stone or riprap spillway
- [ ] Concrete
- [ ] Stone
- [ ] Timber

Use

- [x] Water Supply
- [ ] Power
- [x] Recreation
- [ ] Fish and Wildlife
- [ ] Farm Pond
- [ ] No Apparent Use-Abandoned

Estimated Impoundment Size

- [ ] 1-5 acres
- [ ] 5-10 acres
- [x] Over 10 acres

Estimated Height of Dam above Streambed

- [ ] Under 10 feet
- [x] 10-25 feet
- [ ] Over 25 feet

Condition of Spillway

- [x] Service satisfactory
- [ ] In need of repair or maintenance
- [x] Auxiliary satisfactory
- [ ] In need of repair or maintenance

Explain: _____

_____

Condition of Non-Overflow Section

- [x] Satisfactory
- [ ] In need of repair or maintenance Explain: _____

some Brush

Condition of Mechanical Equipment

- [x] Satisfactory
- [ ] In need of repair or maintenance Explain: _____

_____

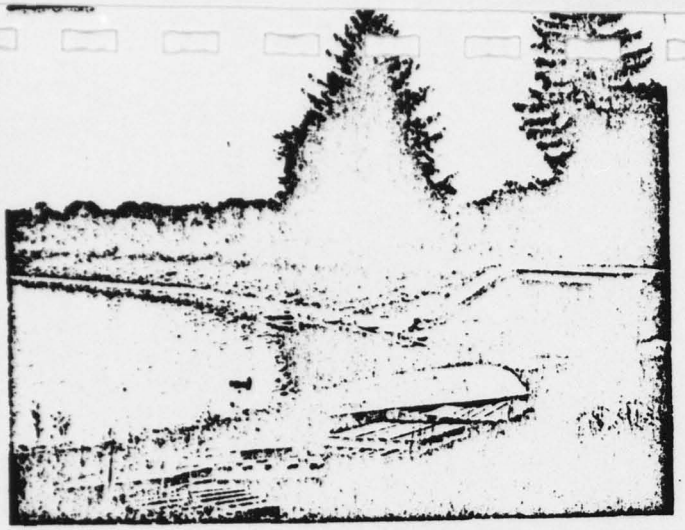
Evaluation (From Visual Inspection)

- [x] No defects observed beyond normal maintenance
- [ ] Repairs required beyond normal maintenance

*Explain Hazard Class, if Necessary _____

_____

1974



ON REPORT Nooksack W.J.
spection) Big = Long

County	Hazard Class*	Date & Inspector
Whatcom	C	9/18/74 KDH

Use

- [x] Water Supply
- [ ] Power
- [x] Recreation
- [ ] Fish and Wildlife
- [ ] Farm Pond
- [ ] No Apparent Use-Abandoned

Estimated Impoundment Size

- [ ] 1-5 acres
- [ ] 5-10 acres
- [x] Over 10 acres

Estimated Height of Dam above Streambed

- [ ] Under 10 feet
- [x] 10-25 feet
- [ ] Over 25 feet

Condition of Spillway

- [x] Service satisfactory
- [ ] In need of repair or maintenance
- [x] Auxiliary satisfactory
- [ ] In need of repair or maintenance

Explain: _____

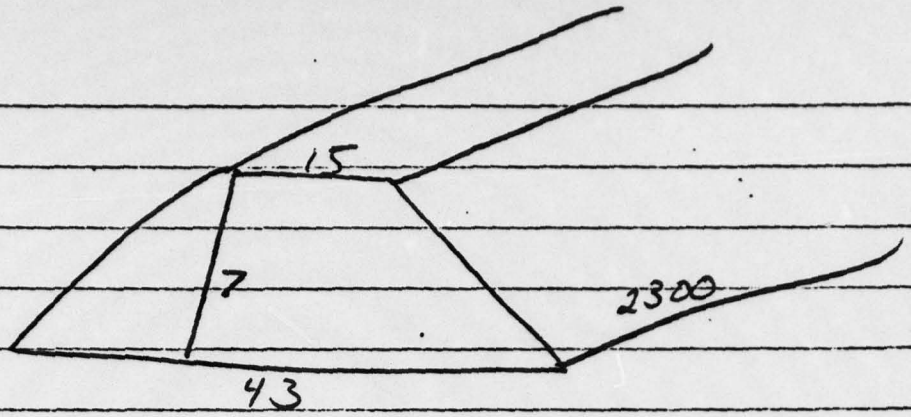
_____

Condition of Non-Overflow Section

- [x] Satisfactory
- [ ] In need of repair or maintenance Explain: _____

some Brush

Condition of Mechanical Equipment



$V = \frac{(58)(7)(2300)}{54} =$ 17292 cu yd

Impounding Capacity

.10
× 640
400
60
6400
× 4
3 | 25600
85.

HIGH WATER PRESSURE CAUSES DAM AT WASHINGTON LAKE TO SETTLE IN SEVERAL PLACES

Newburgh Register July 2, 1912

Water Board Asked to Pay For Damages Done By Overflow In Flooding Farm Lands Adjacent to the Reservoir and Silver Stream

Newburgh Register
JUL 2 1912

To Miss Munro
23 Jy 12

As the result of the recent high water a part of the dam at Washington Lake has settled in several places, and steps were taken at the meeting of the Water Commissioners to remedy the condition. Contractor Patrick H. O'Hehir, of Warwick, who was engaged on the original work, has agreed to do the work on the unit basis under which his former work was paid for. He has not yet removed his machinery and tools, and President Turl brought the matter before the Board last evening in order that the work might to authorized before he did.

After a lengthy discussion, it was decided to direct City Engineer Blake to submit an estimate of the cost, owing to the condition of the Water Board's finances. The plan is to put crushed stone around the top of the dam, between Gretsinger's swamp and the gatehouse, to prevent a further washing away. It will cost considerably more to have the task performed in the future. It was said that had it not been for the settling of the dam there could have been four inches more water in the reservoir during the last few months.

Engineer Blake is to submit the estimate within ten days, after which a special meeting of the Board will be called to take action on it. Commissioner Wilson is against ordering the job at the present time as he does not see where the money is coming from. If O'Hehir takes his tools away the commissioners can get other bids when they are ready, he claims, and he is in favor of waiting until the water is low enough to see what the actual damage is.

Attorney Edward J. Collins appeared before the Board in the interests of William A. Clark, whose 76-acre farm adjoining Washington Lake is affected by the raising of the dam. Water backs up under the bridge of the road at that point and floods his grounds but the commissioners claim that part of the flooding is caused by a spring on the Clark property.

Regarding this feature of the case, Mr. Collins contends that a man has a right to flood his own property, but the point in question is just how much of the flooding the Water [illegible] from time to time. He asks that the condition be remedied or a financial settlement effected. The matter was referred to a committee composed of President Turl and Commissioner Brush, who will confer with Corporation Counsel Graham Witschief and Attorney Collins. Mr. Witschief has had photographs taken of the Clark flooding, and Engineer Blake is making a survey, which will be used in settling.

In a communication from Counsel Witschief, a notice was enclosed from Isaac N. Blanch, against whom proceedings were authorized at the last meeting of the Board, it being claimed that he was violating the state laws in connection with his premises along Silver Stream. During the annual inspection last month the Board reached an agreement with him whereby he was to remove a certain objectionable outhouse to a point indicated by the Board of Health. His damages were fixed at $15, and this amount was ordered paid to him if the inspector reports that the agreement has been carried out satisfactorily.

Attorney Witschief reported that he could find no liability on the part of the city in connection with the alleged flooding of lands owned by Isaac Calyer, near the Washington Lake dam, and that information in the case of Fred D. Calyer was insufficient for an opinion.

The attorney stated that he has procured the names of the owners of the Merritt and Stansbrough properties, also affected by the raising of the dam, and is in communication with them regarding a settlement.

Mr. Witschief reported that he thought there would be little trouble in coming to an agreement with J. W. D. Goodwin, whose sheep farm along Silver Stream is under consideration by the Board of Health. The difficulty arises by reason of the peculiar location to the stream, and the corporation counsel is going to have measurements taken, with a view of ascertaining the damage.

Commissioner Wilson reported the complaint of Bird W. Whitaker, of 77 Henry avenue, who is unable to get water above the first story in his home since the Washington Lake improvements. Assistant Superintendent the pressure at Clark street and Henry avenue and Lander street. It was said that it should be 45 points at those points, as it is 46 at Carson avenue.

There was a long-winded discussion on the advisability of allowing employees of the Board a vacation of two weeks, with pay, and it was finally passed by with no action at all. Commissioner Brush moved that the vacations be allowed, including the superintendent, assistant, the two engineers at Washington Lake, and the two helpers in the city. It was not seconded as the other members said they could not foresee the effect it would have on the public in general at this time when the Board is entirely without funds

After standing all winter, water from the construction work of the Pittsburg Contracting Company, on the aqueduct, is to be emptied in the near future, according to the report of the watchman along Silver Stream. Superintendent Stanton was instructed to notify the gatekeeper to open the 16-inch gates when the water is emptied, which will allow it to go through into the pond without coming into the city mains.

A notice was read from City Clerk D. J. Coutant in which he recited the action of City Council on the upper Broadway improvement plan, requiring the Water Board to have all mains and supply pipes laid by September 1st. There is to be a connection at every 25-feet, although Superintendent Stanton was inclined to believe that such was not necessary, as there are places where no buildings will probably ever be put up.

It was stated that under the rules of the Board, property owners will have to pay for the connecting pipes where they are put in for the first time, but the Board must stand the expense of replacing old ones.

September 17, 1912.

Water Commissioners,

Newburgh, N. Y.

Gentlemen:-

It is reported that the dam at Washington Lake has settled in several places and that you are doing some reconstructing on same, but no plans for said reconstruction have been filed with this Commission, as required by law.

Enclosed please find a sheet of requirements for filing plans with this Commission. We should also like to have a report on the damage to the lake and the nature and character of the settlement.

Very truly yours,

Conservation Commission,

By

Inspector of Docks and Dams.

K/C.

Encl.

At Albany on Tuesdays.

September 17, 1912.

Water Commissioners,

Newburgh, N. Y.

Gentlemen:-

It is reported that the dam at Washington Lake has settled in several places and that you are doing some reconstructing on same, but no plans for said reconstruction have been filed with this Commission, as required by law.

Enclosed please find a sheet of requirements for filing plans with this Commission. We should also like to have a report on the damage to the lake and the nature and character of the settlement.

Very truly yours,

Conservation Commission,

By

Inspector of Docks and Dams.

HK/C.

Encl.

At Albany on Tuesdays.

May 4, 1914.

Mr. William J. Blake,

City Engineer,

Newburgh, N. Y.

Dear Sir:-

Receipt is acknowledged of a set of six prints of the Washington Lake dam of the Newburgh Water Works, sent us for our files. We thank you for these prints.

Very truly yours,

Conservation Commission,

By

Commissioner.

McK/C.

REPORT

ON THE WATER SUPPLY

Newburgh, New York

GEORGE W. FULLER

AND

JAMES C. HARDING

Consulting Engineers

August 8, 1921

The engineers stated that this was the purest supply that could then be obtained and promised to be the most permanent other than, perhaps, the Gidneytown Stream. They stated that the watershed of about 600 acres including the lake was capable of producing about 300,000 gallons of water per day in exceptional dry years, and 400,000 gallons per day in average years. They also stated that by diversion of adjacent watersheds a greater supply than this could be obtained when desired.

WASHINGTON LAKE

When Washington Lake or Little Pond was first investigated as a source of water supply for Newburgh, it was a natural pond formed in the main depression of the present basin. The overflow from this small basin and the outlet to the entire watershed, of about 0.92 square mile, was through the ridge to the east, a distance underground of about 4600 feet with a drop of about 40 feet from surface to surface of ground.

When this pond was first utilized, beginning experimentally in 1852, a ditch was dug in the slope between the Swallow Hole and the Little Pond and a dam was constructed with gates so that the water level was raised some 8 or 9 feet; probably to an elevation about 20 to 23 feet below its present level. This dam was approximately at the location of the present one and was raised from time to time until the water surface was at elevation 287.5 or

10 feet lower than it is at present. This was maintained until 1911 when the final raise was made to elevation 297.5.

This entire Washington Lake basin was undoubtedly formed many years ago by the washing out of the surface clay and hardpan through the shattered limestone ridge between it and Monell Creek valley, and as time went on these limestone fissures filled up beneath the lake and beneath part of the Lockwood basin and quite likely are still filling up from the wash of the present small watershed tributary to the Swallow Hole and other "sink holes" in the vicinity. It is quite likely that there is still unfilled beneath the Lockwood basin some of this underground channel as was evidenced by a settlement near the easterly embankment of the basin some years ago. It is certain that surface openings giving access to this underground channel are more extensive than is indicated by the Swallow Hole alone for small overflows from the Lockwood basin find their way underground before they reach the Swallow Hole.

The visible evidences at the present time of this subterranean passage through the ridge are the Swallow Hole; depressions near the Lockwood basin on the city property; and other depressions within some hundred feet of Patton Avenue, all of which take surface water runoff from the watershed. On the east side of the ridge is the Trout Hole with springs in the masonry lined well in the southerly end of the old Monell Reservoir and in

the bottom of this reservoir and gate chamber. Undoubtedly most of this spring water is from the local watershed, except during wet weather.

EARLY USE OF WASHINGTON LAKE

For nearly 20 years water was taken from Washington Lake through a ditch to the Swallow Hole, through the underground pasage to the Trout Hole and then to the 12 inch main line to the city. Where the water issued from the ground as springs at the Trout Hole, a reservoir was constructed about 204 feet long and 186 feet wide. At the southerly end the important springs were walled up in a well below the bottom of the reservoir, and at the northerly end there was a gate chamber with overflow planks, screens and gates leading to the 12 inch main into the city. This roundabout way of using Washington Lake water was continued until 1872, when the 24 inch and 20 inch pipe line was built from Washington Lake to the city. From this time until 1877 the Monell reservoir was used as a low level supply to parts of the city but after 1877 it was used but little, except as a balance, it being filled by water backing up from the city through the 12 inch line. It was also used during a few years, 1883, etc., in hot weather, water being turned through the subterranean passage and this reservoir in an attempt to improve its quality. It has not been used for many years.

ADJACENT WATERSHEDS

In 1852 Washington Lake or Little Pond had an area of about 50 acres and a watershed of about .92 square mile, with an estimated supply capacity

of about 300,000 gallons daily from its watershed when used in connection with the underground passage. Later, and previous to 1868, a dam was constructed across Silver Stream, the watershed of which is just southerly of Washington Lake and a line of 24 inch pipe, some 2000 feet in length, was laid between the stream and the lake.

Much trouble was afterwards experienced with this pipe line and it was finally replaced with the present open canal. As it now stands the elevation of the spillway of the Silver Stream dam is 317.5; the elevation of Washington Lake is 297.5; and the elevation of the bottom of Monell Reservoir, 232. When it was found that the runoff from both Washington Lake watershed and Silver Stream was not adequate with the storage provided to furnish Newburgh with a water supply, the upper end of Patton Brook was turned into the lake through a canal locally spoken of as the Murphy Ditch. This diversion as constructed and used has never been of any great value but is capable of furnishing considerable water if properly reconstructed.

QUALITY

It is interesting to note the conflicting statements as to the quality of the Washington Lake water in the earlier reports and as it has an important bearing on the necessity for filtration, it is gone into here at some length. Consulting Engineer French, in 1852, stated:

> "In view then of the purity of the water of "the Pond and its entire freedom from the lia- "bility of being muddy or turbid from freshets "or subject to receiving impurities of any kind

"and its great elevation above and moderate "distance from Newburgh," etc.

This early view may be contrasted with reports of the Water Commissioners as early as 1868, and with the report of John H. Rhodes in 1870. Enough importance evidently was not attached in early days to the large amount of organic matter which would naturally be contained in the runoff from a watershed such as this, which in connection with the shallow pondage tended toward warm temperatures and the rapid growth of vegetable organisms which die, decay and give off objectionable odors.

It would appear from the reports that the water became unpleasant to use not many years after the plant was put in operation and that by 1870 much trouble was experienced with it.

An interesting report as to the quality of the water from Washington Lake is that of the Water Commissioners of 1884, in which they state that after experiencing much trouble with tastes and odors in the water they tried an experiment to improve the quality by passing the lake water into the new reservoir (probably Lockwood Basin) and thence into the Swallow Hole to the Trout Hole and then to the city pipes. They state:

"The passage from the Swallow Hole to the "Trout Hole is a natural unexplored one in the "bowels of the earth, and is three-quarters of "a mile long. As the water dashed into the "subterranean passage at the Swallow Hole "and splashed over the rocks and disappeared "in the depths, it was broken to pieces and "churned into a foam. Whether it encountered "in its subsequent path any system of filtration

"is not known, but the churning process "seemed to separate the water from its bad "odor. The one passed on to the city while "the other in the form of gas rose so thick as "to cloud the air, and so strong that a person "could not stay close to the opening and en- "dure it.

"Why it was that the change was produced "is not clear in our minds, but our belief is "that by the water being cooled and aired by "being torn asunder in its passage through the "rocks, allowed the impure gases to separate "from the water and pass off into the open "air. Should our experience in the future be "the same, the discovery will be of such value "to the city that we could not be induced to "part with the subterranean passage as a part "of our system for any consideration."

In the March, 1885, report of the Water Superintendent it is stated that there was an appearance of growth of vegetation in the Lake in the latter part of April, 1884, the water being opaque and of a greenish milky appearance. It was turned into the Swallow Hole as during the previous year and by this method the inhabitants had an abundant supply of good, healthy and palatable water the year round. The Superintendent stated that it was clearly demonstrated that the water lost its bad smell and taste in its passage through the ridge.

In spite of the fact that the Commissioners and Superintendent placed such great faith in this method of treating the water they recommended the construction of a filter plant in 1887, but this was turned down by a vote of the people. In that year

also, early in June, the water took on its annual change for the worse and it was turned through the underground passage to the Trout Hole as in former years. Unfortunately the water continued to grow worse instead of better and there was much complaint about it. The Commissioners put in below the new reservoir a small chamber and aerator which seemed to improve the water for a few days. At least it was thought some improvement resulted as the trough and bars through which the water flowed were covered with sediment and living organisms, and the Superintendent states, "how much worse it might have been (if such a thing is possible) we can only conjecture." It was after failure of this work that a filter plant was advocated by the Commission.

Several times muck was removed from the shallow parts of the lake and during several years fish were removed in considerable quantities.

In 1889, when the water warmed up in June, the fish began dying and this condition existed for about 20 days requiring four men, a greater part of the time, to remove them from the water. Between two and three wagonloads were taken out and buried. The water was turned through the Swallow Hole and apparently this helped it for a short time when it became even worse than it had been in the lake previously and was therefore turned back through the 20 inch pipe line.

The raising of the dam in 1910 probably improved the quality of the water to a considerable extent by increasing the depth, but it is still unsatisfactory during warm weather.

PIPE LINES

During the first 20 years of the existence of the municipal water works, as might be expected, trouble was experienced for the most part with insufficient pipe capacities and pressure. Several engineers were employed by the city to correct these conditions and to reduce what was then considered an extravagant use of water. Mr. Rhodes in 1870 after careful examination stated that the city was then using about 44 gallons of water per capita and that a considerable portion of the population still derived their water from other sources. He stated that with proper management and including manufacturing and industrial use, 50 gallons per capita was a reasonable allowance and he estimated the future population and consumption as follows:

TABLE I.

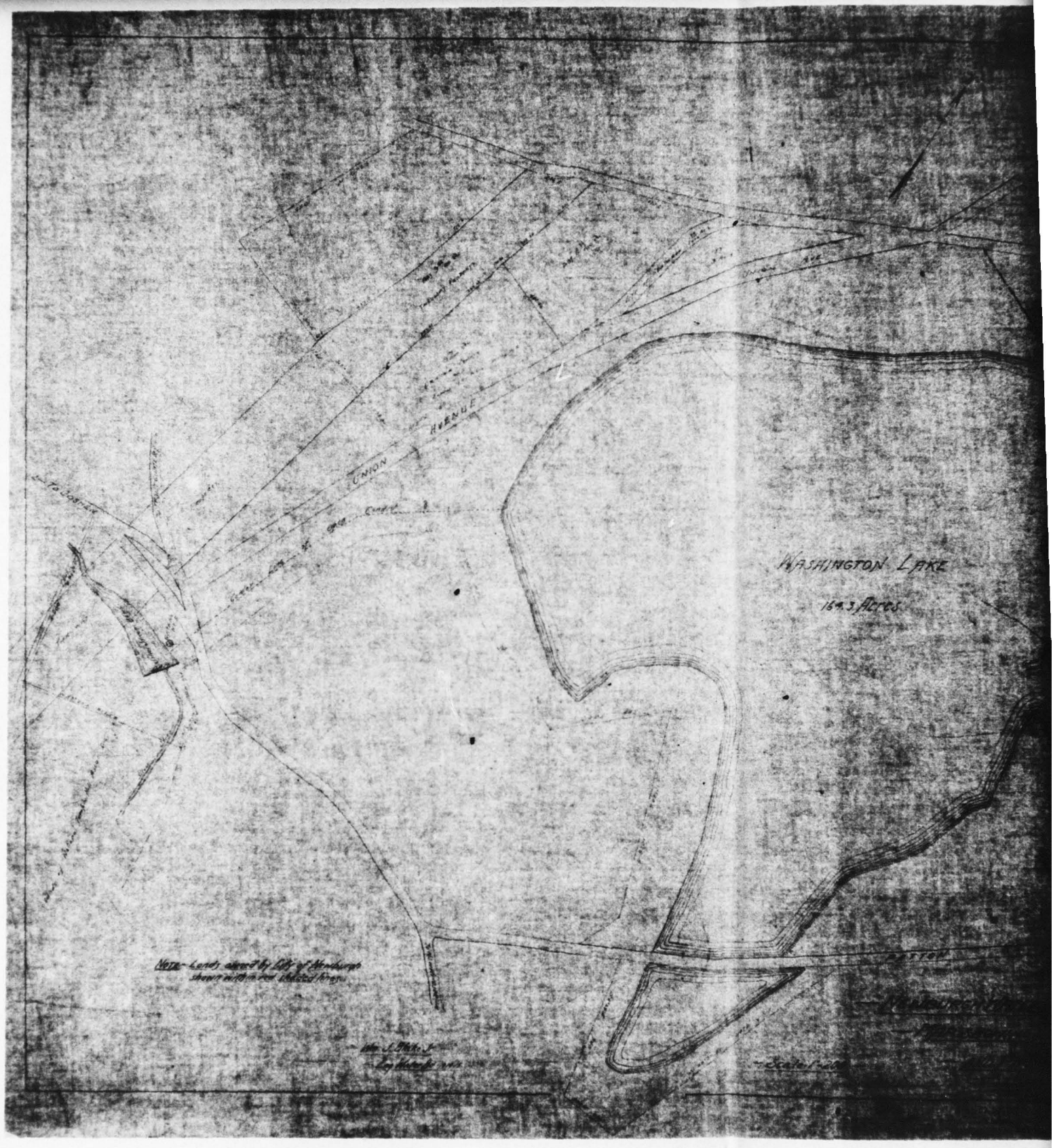
1870 ESTIMATE OF POPULATION AND WATER CONSUMPTION

Year	Population	Gallons	Maximum Daily Supply	Maximum Hourly Supply
1870	17,000	750,000	794,127	41,418
1875	19,550	916,820	.....	.....
1880	22,100	1,108,000	1,175,000	73,120
1885	.....	.....	1,410,882	87,799
1890	28,730	1,436,800	1,521,000	91,879

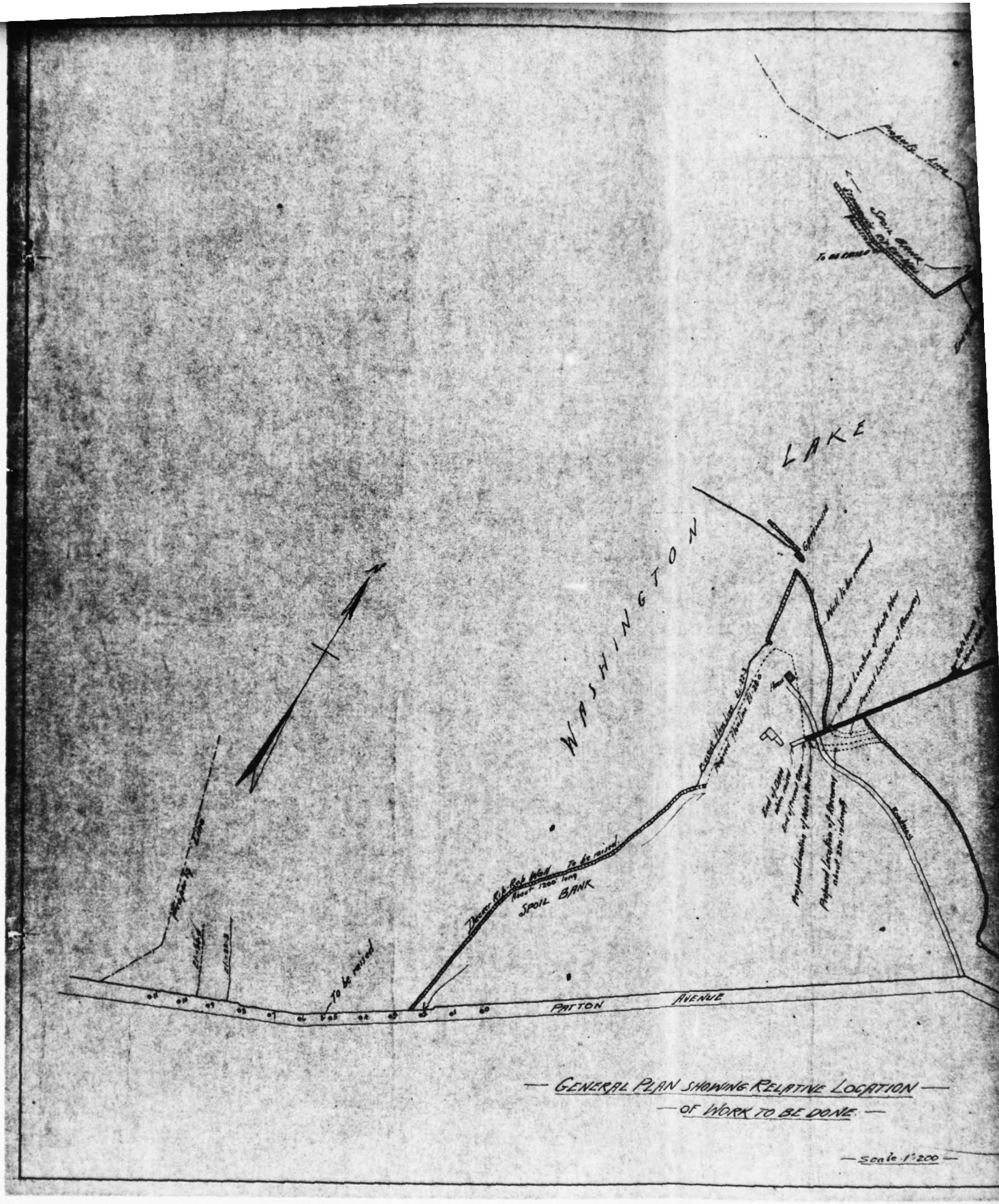
The first pipe lines laid in the city were 4 inches in diameter with a total length of 7,244 feet in 1852. The 12 inch line from the Monell Reservoir, 15,215 feet in length, was laid in 1854 and during the same year 4,865 feet of 6 inch pipe and 21,106 feet of 4 inch pipe were laid. Four and six inch extensions, mostly the former, were made until 1872, when the 24 inch and 20 inch main was laid from the lake to City Terrace. There were 3,128 feet of 24 inch pipe

APPENDIX E

CONSTRUCTION DRAWINGS

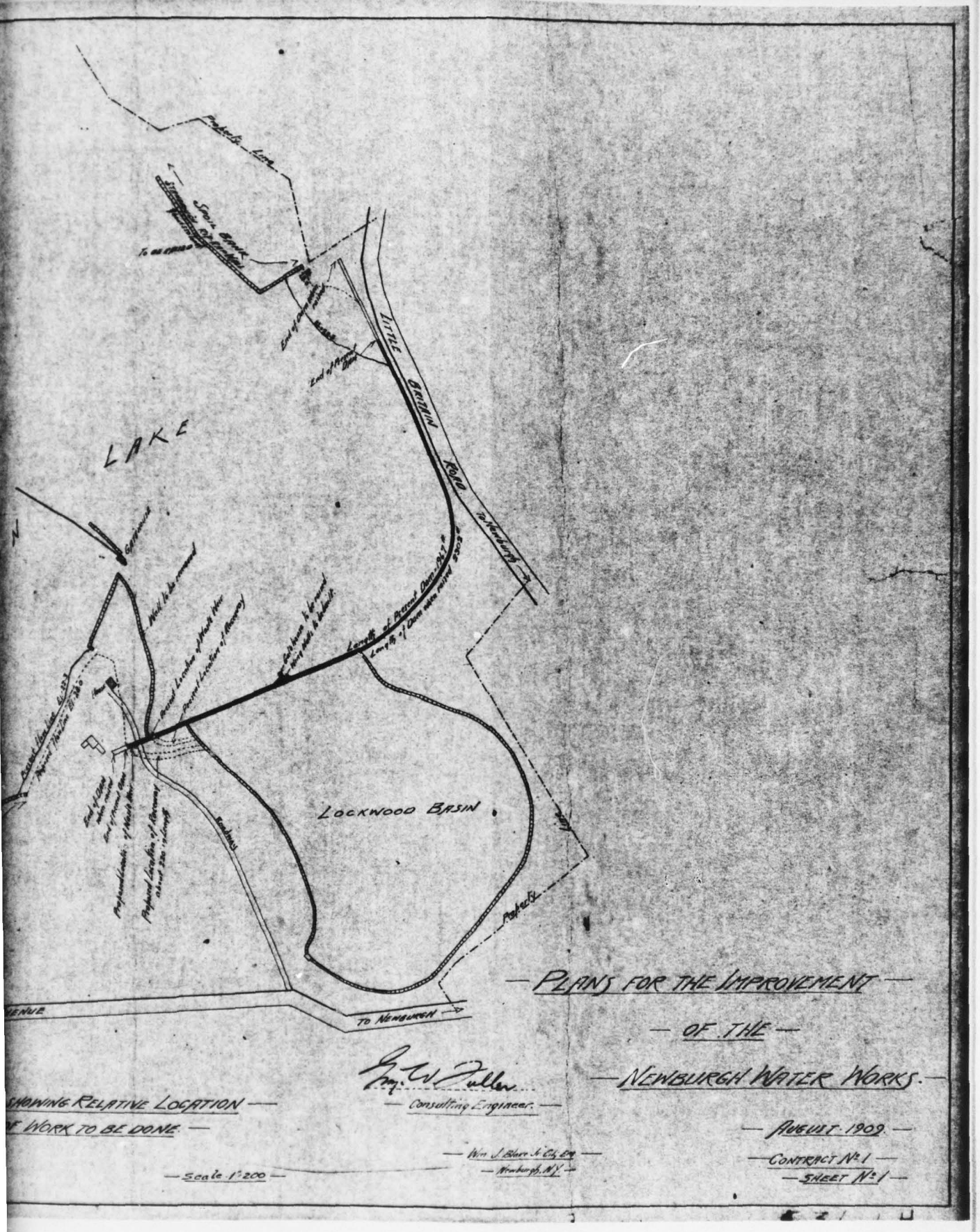

UNION AVENUE
WASHINGTON LAKE
164.3 ACRES
Note- Lands owned by City of Hamburgh shown within red dashed lines.


LAKE
PATTON



— GENERAL PLAN SHOWING RELATIVE LOCATION —
— OF WORK TO BE DONE —

— Scale 1" : 200 —



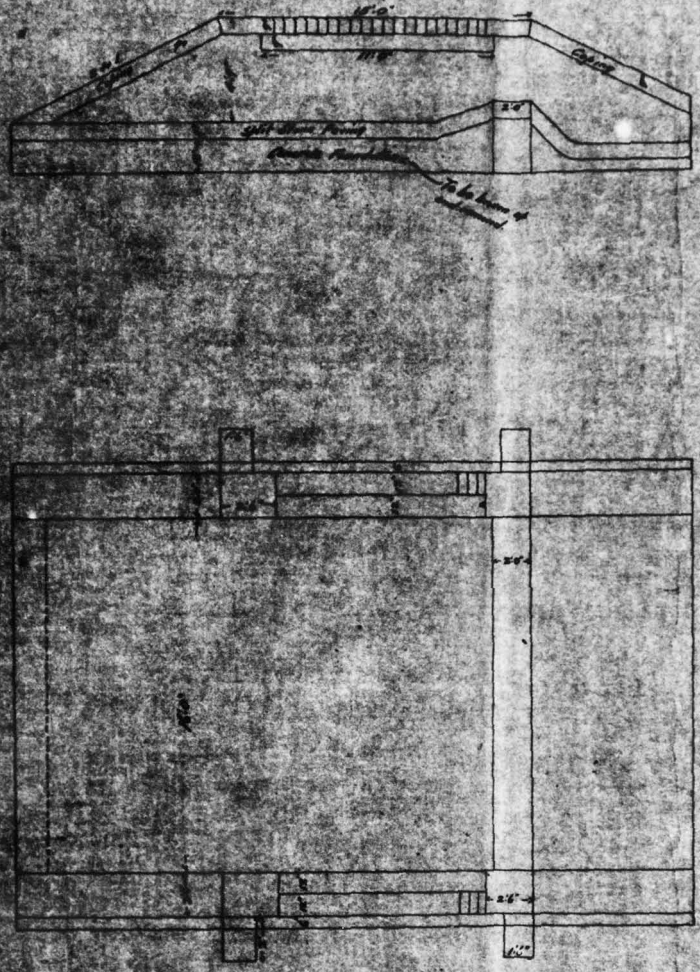
PLANS FOR THE IMPROVEMENT
OF THE
NEWBURGH WATER WORKS.

SHOWING RELATIVE LOCATION
OF WORK TO BE DONE.

Scale 1" = 200'

Eng. C. H. Fuller
Consulting Engineer.
Wm. J. Blair & Co. Eng.
Newburgh, N.Y.

AUGUST 1909.
CONTRACT No. 1
SHEET No. 1

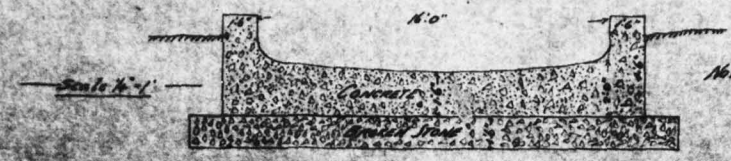


PLAN OF PRESENT MASONRY WASTE WEIR

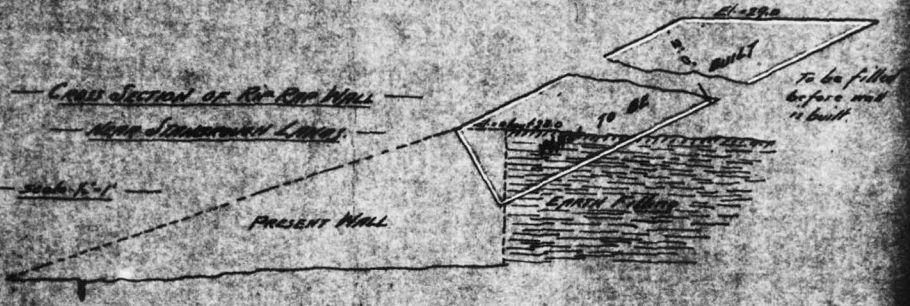
TO BE TAKEN DOWN AND REBUILT AT A POINT

ABOUT 75 ft. SOUTH OF ITS PRESENT LOCATION.

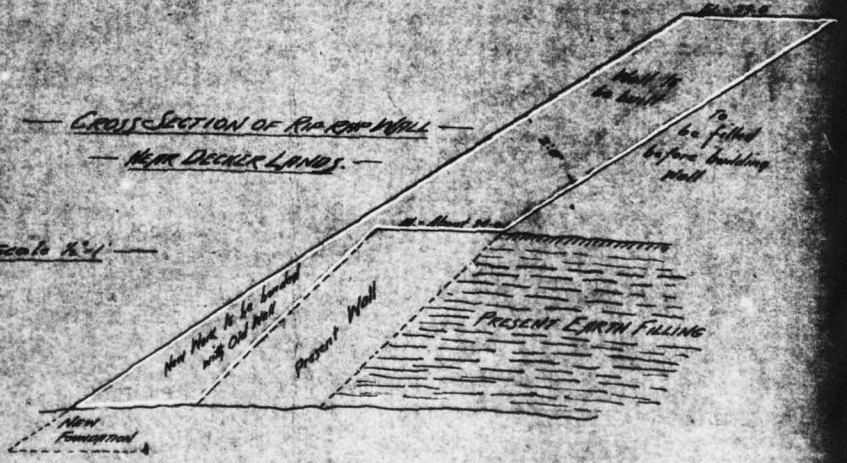
Scale 1/4" = 1'



— Cross Section of Proposed New Raceway —



— Cross Section of R.R. Ry. Wall —
— Near Stonecrest Lands. —
Scale ½"=1'



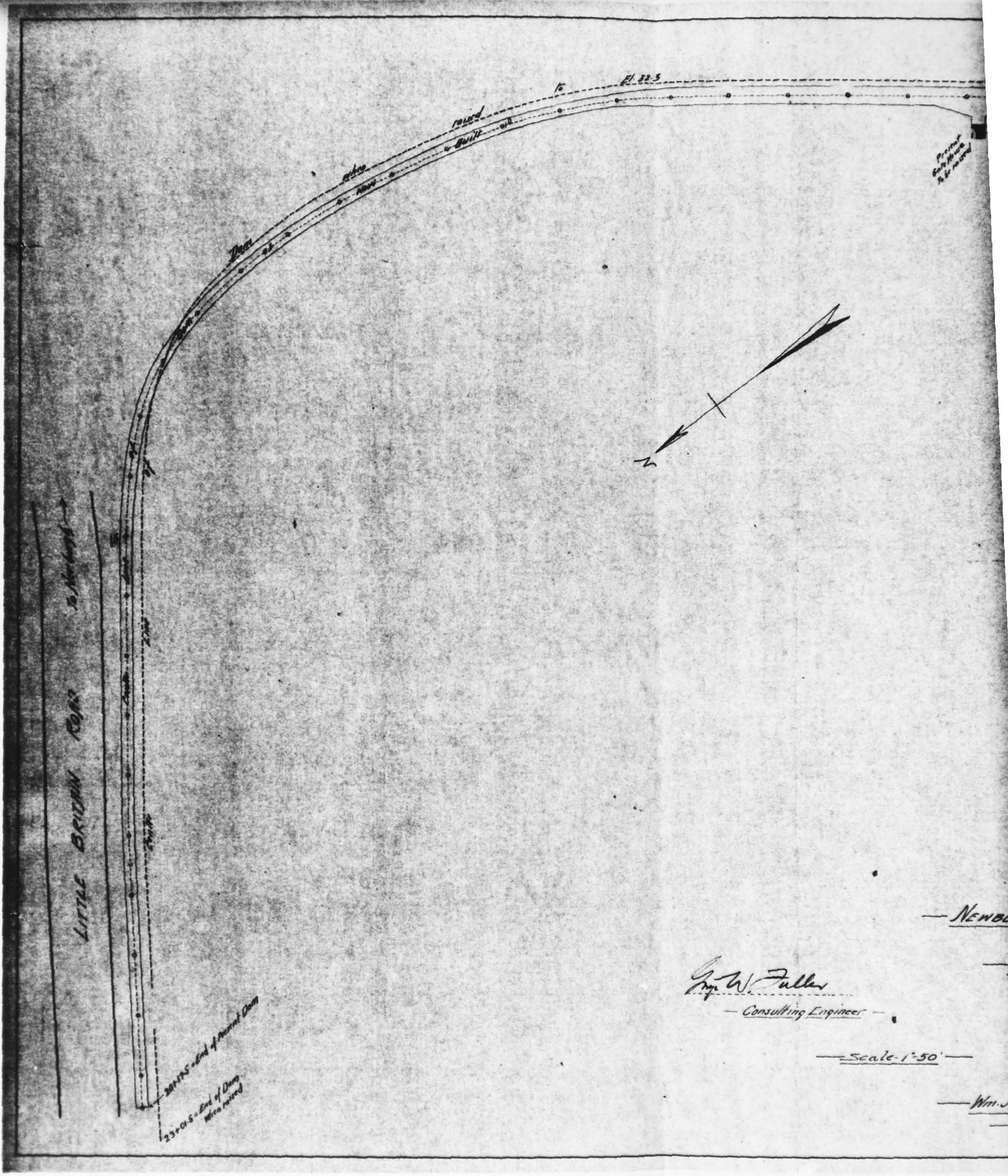
— Cross Section of R.R. Ry. Wall —
— Near Decker Lands. —
Scale ½"=1'

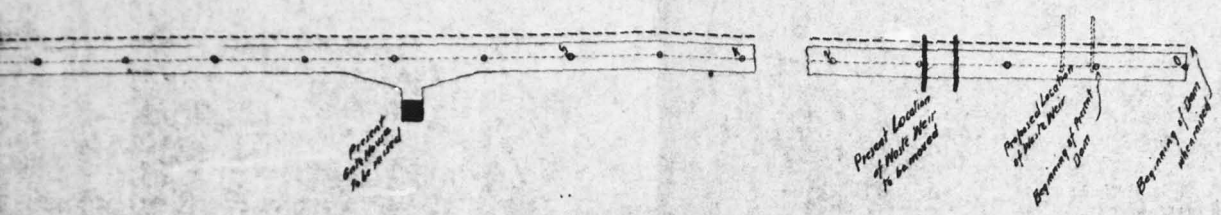
— Newburgh Water Works Improvement —

Wm. J. Blake & Co, Eng
Newburgh, N.Y.
Nov. 1909

Contract No. 1
Sheet No. 6

Consulting Engineer


El. 32.5
Present Gate House to be raised
LITTLE BRITAIN ROAD
To Newburgh →
20+17.5 = End of Present Dam
23+01.5 = End of Dam when raised
Geo. W. Fuller
— Consulting Engineer —
— Scale 1"=50' —
— NEWB
— Wm. J



— NEWBURGH WATER WORKS IMPROVEMENT —

— PLAN SHOWING PRESENT AND NEW LOCATIONS —

— OF CENTER LINES OF DAM — AUG. 1909 —

W. Fuller

— Consulting Engineer —

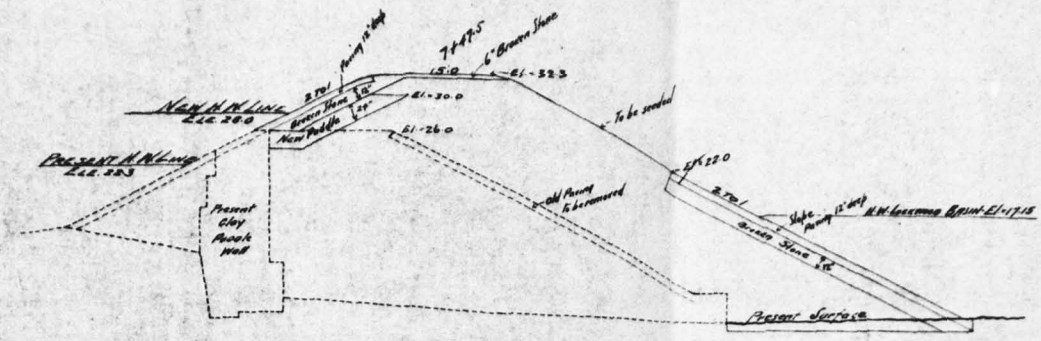
— Scale 1"=50' —

— CONTRACT No. 1 —

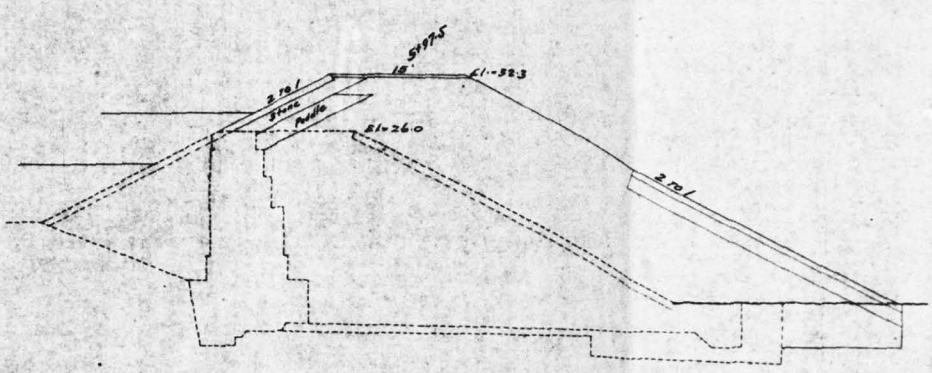
— SHEET No. 2. —

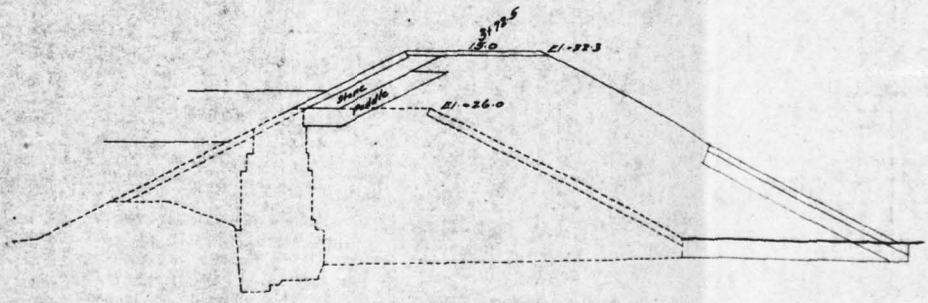
— Wm. J. Blake Jr. City Eng. —

— Newburgh, N.Y. —

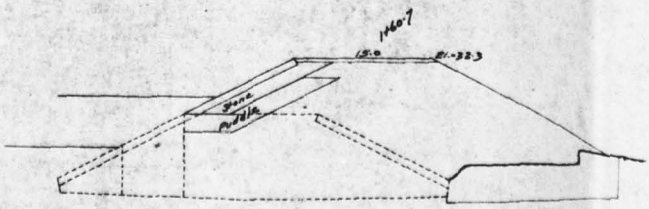


— Detail Section through Dam between Lake & Lockwood Basin —



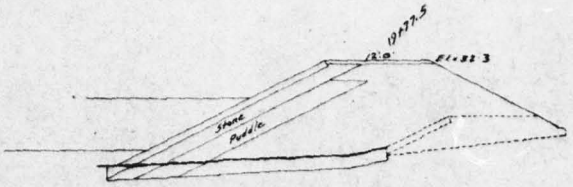


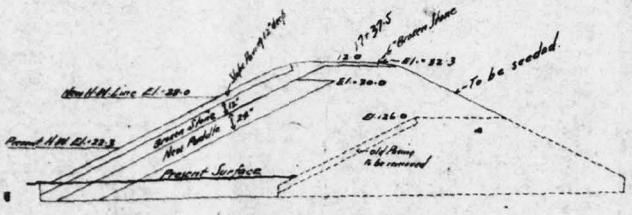
Elev. 22.3 P



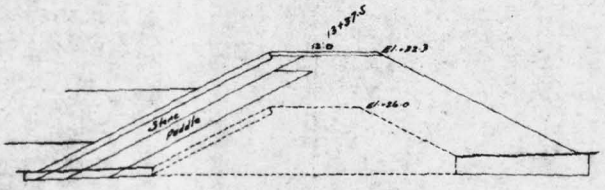
G. W. Fuller
— Consulting Engineer —

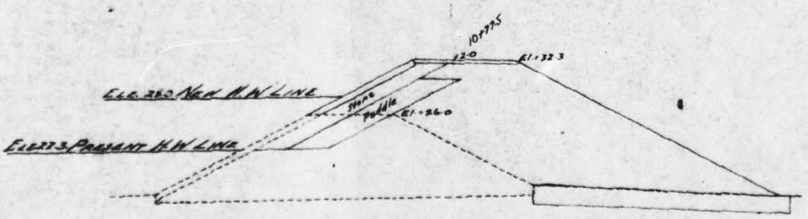
— Dotted Lines represe
— as now constructed. —





— DETAIL SECTION THROUGH DAM —





G. W. Fuller
Consulting Engineer.

— NEWBURGH WATER WORKS IMPROVEMENT. —

— SECTIONS SHOWING PROPOSED ADDITION TO DAM —

— Dotted Lines represent Dam as now constructed. —

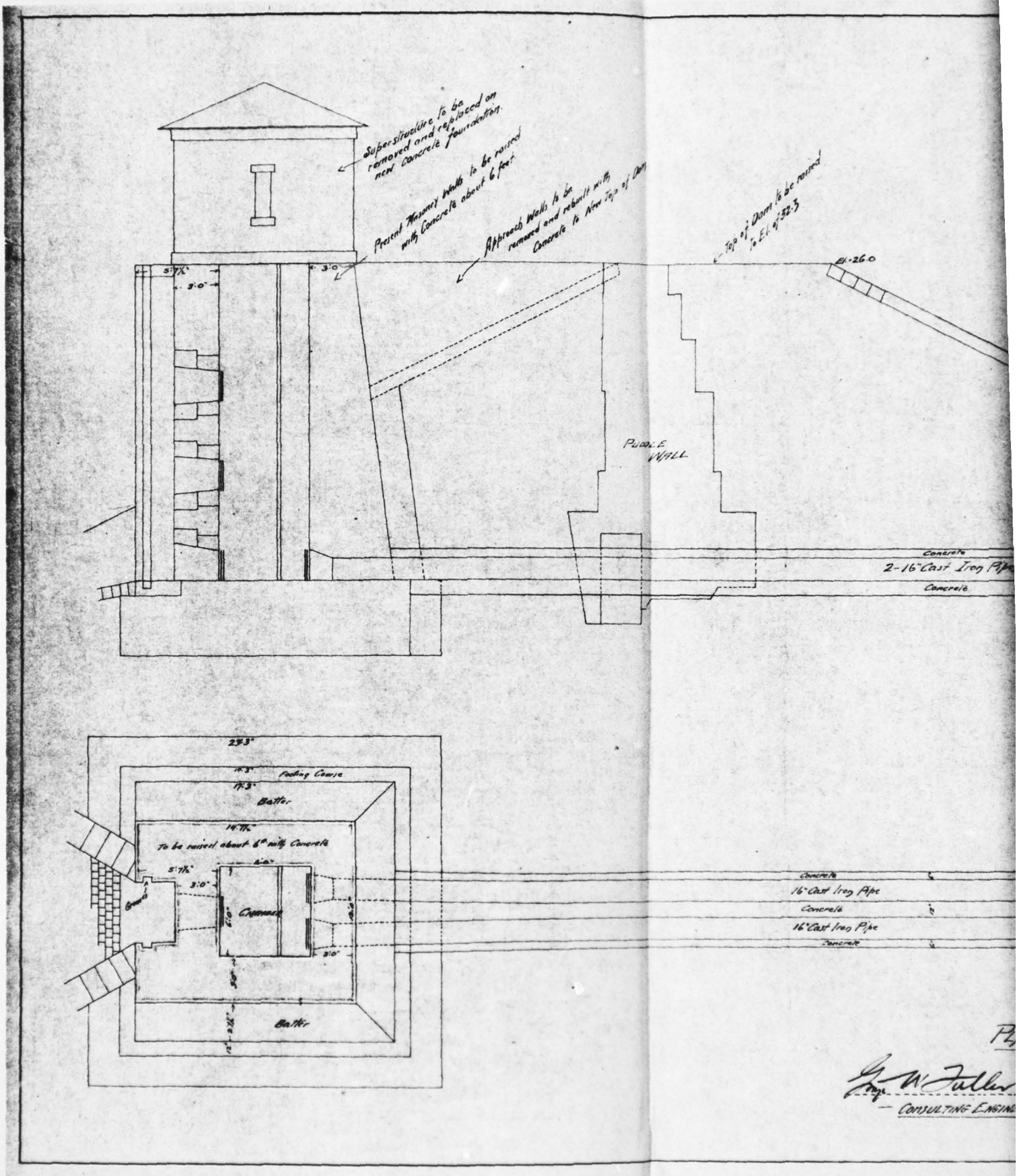
— Aug. 1909 —

— Scale 1"=10' —

— Wm J. Blake Jr. Civ. Eng —
— Newburgh, N.Y. —

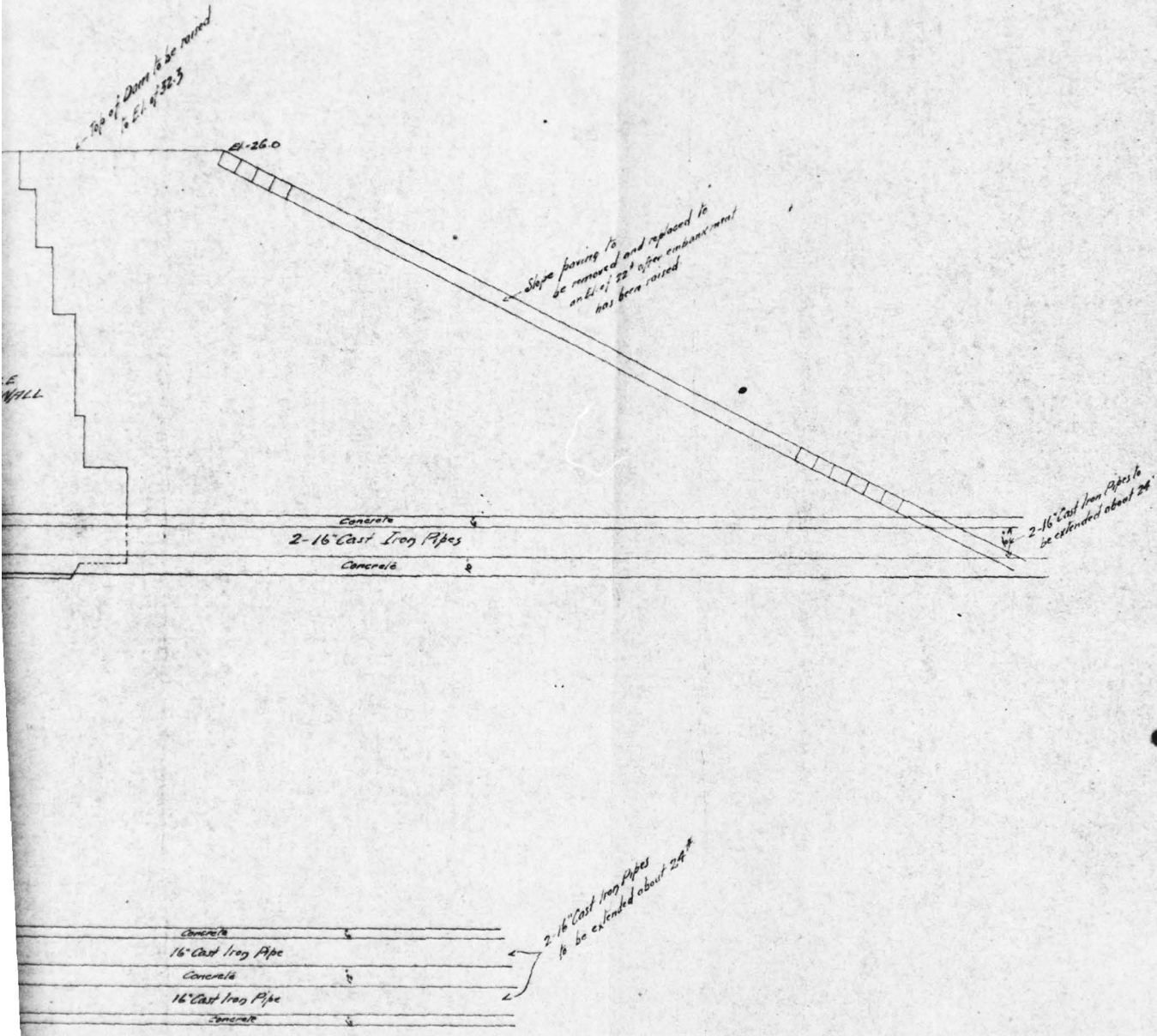
— CONTRACT No 1 —

— SHEET No 3 —



Engr. W. Fuller

— CONSULTING ENGINEER



NEWBURGH WATER WORKS IMPROVEMENT.

PLAN OF EXISTING GATE HOUSE AND PIPE LINES THROUGH DAM.

AUG. 1909

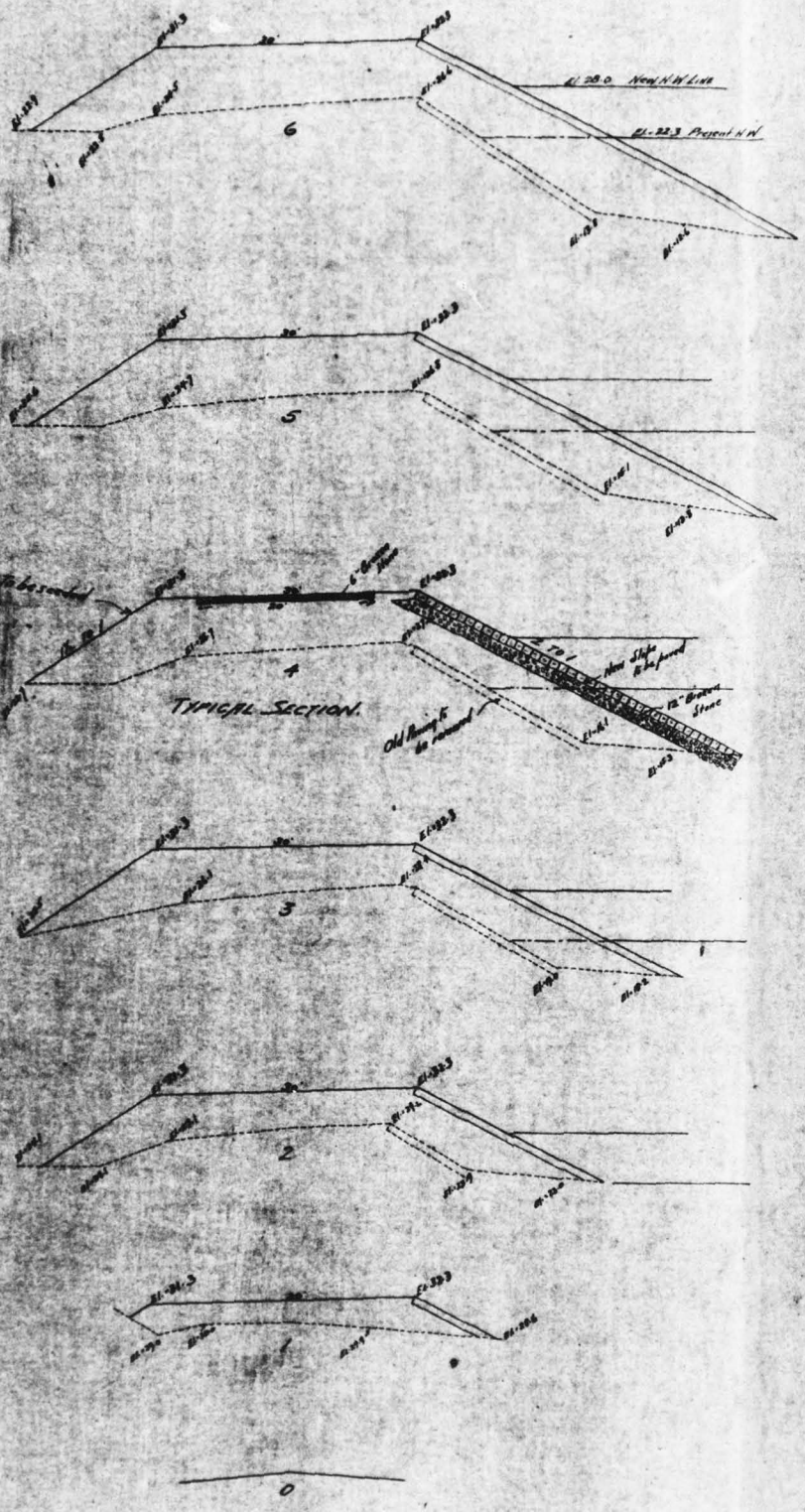
Geo. W. Fuller
CONSULTING ENGINEER.

Scale 1/8" = 1'

Wm J Blake Jr. Civ. Eng.
Newburgh, N.Y.

CONTRACT No. 1

SHEET No. 4



— Newbu

G. W. Fuller
— Consulting Engineer —

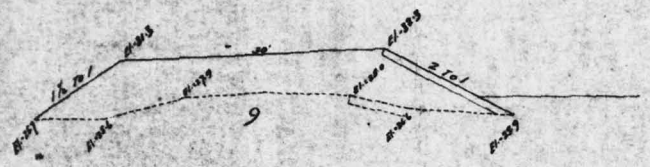
NOTE- Dotted Lines represent Present Surface.

1

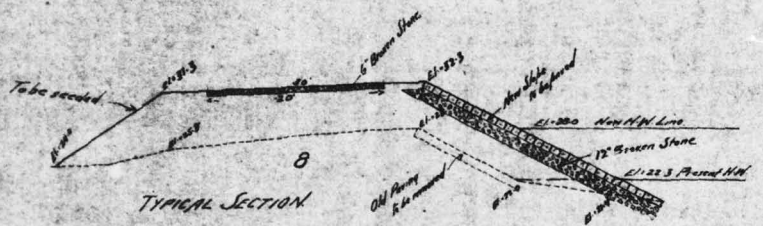
2

11

10

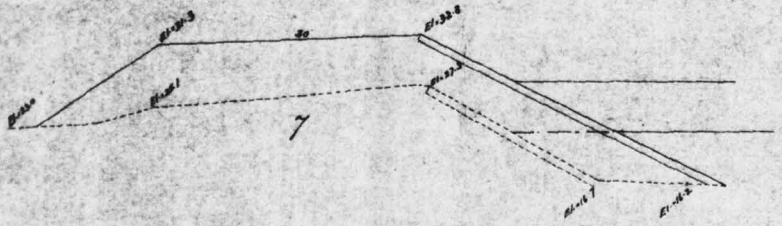


9



8

TYPICAL SECTION.



7

NEWBURGH WATER WORKS IMPROVEMENT

CROSS SECTIONS FOR RAISING PATTON AVENUE.

AUG 1909

W. Fuller

Consulting Engineer

Scale 1"=10'

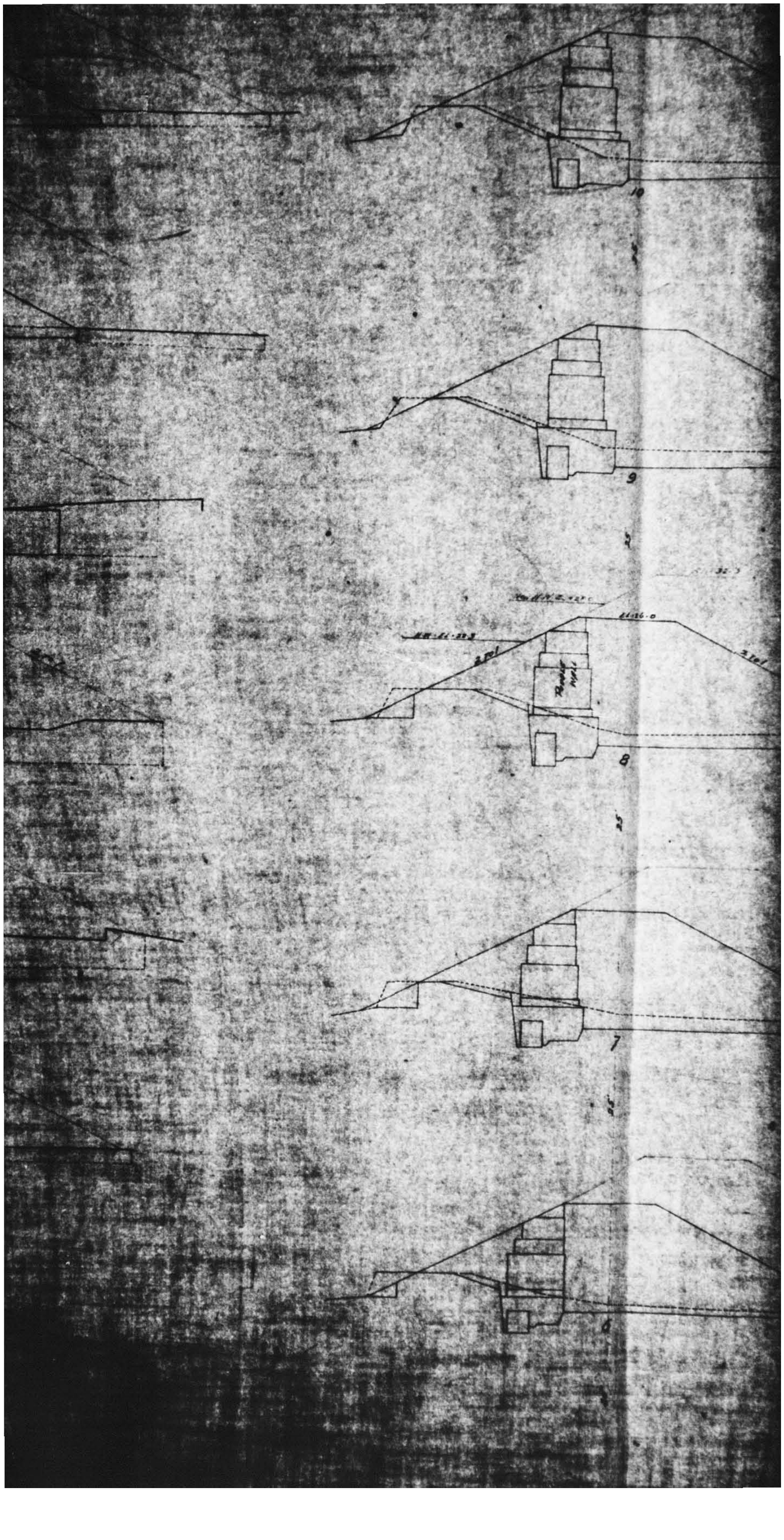
Red Lines represent Present Surface.

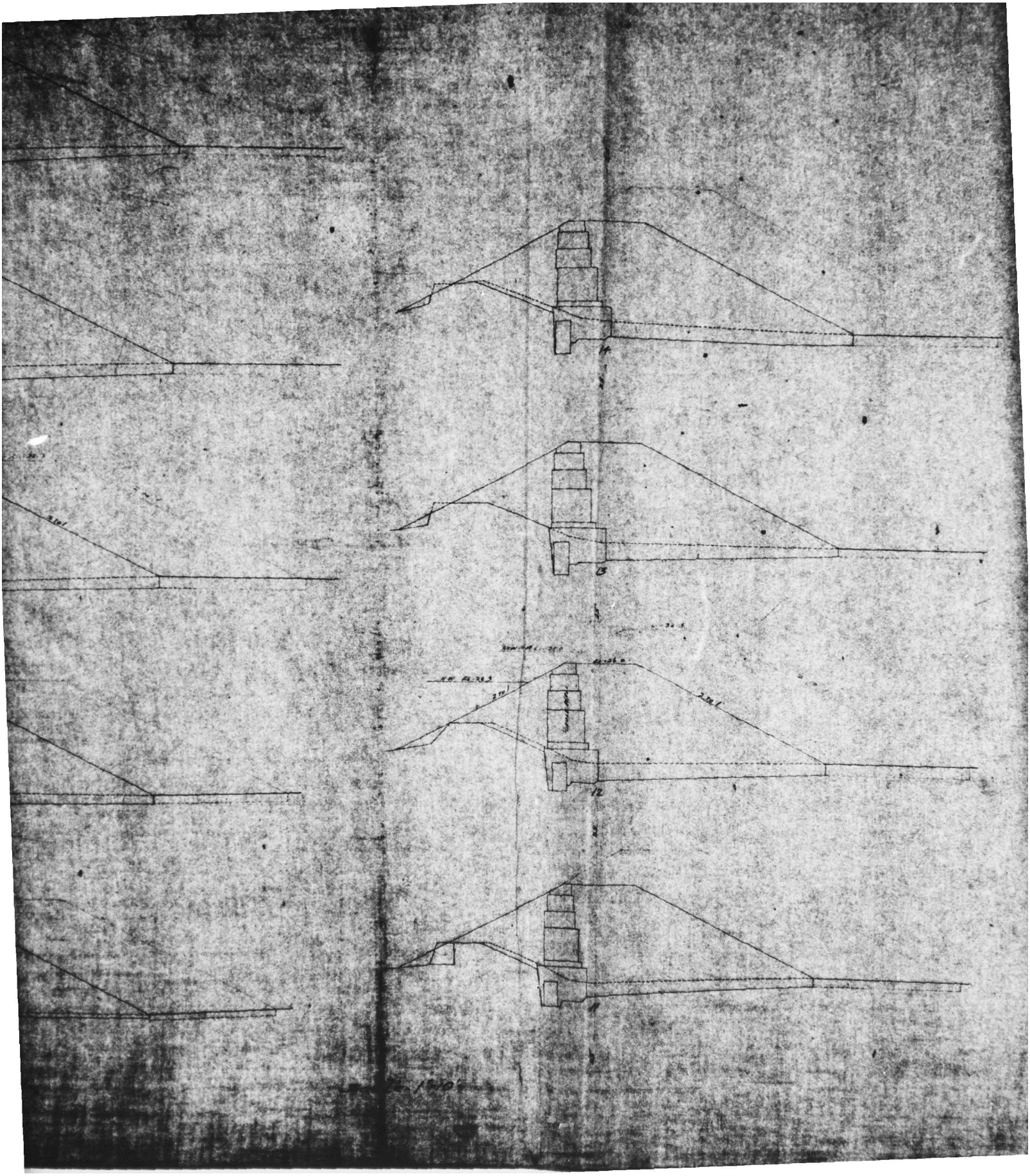
Wm. J. Blake Jr. Cil. Eng

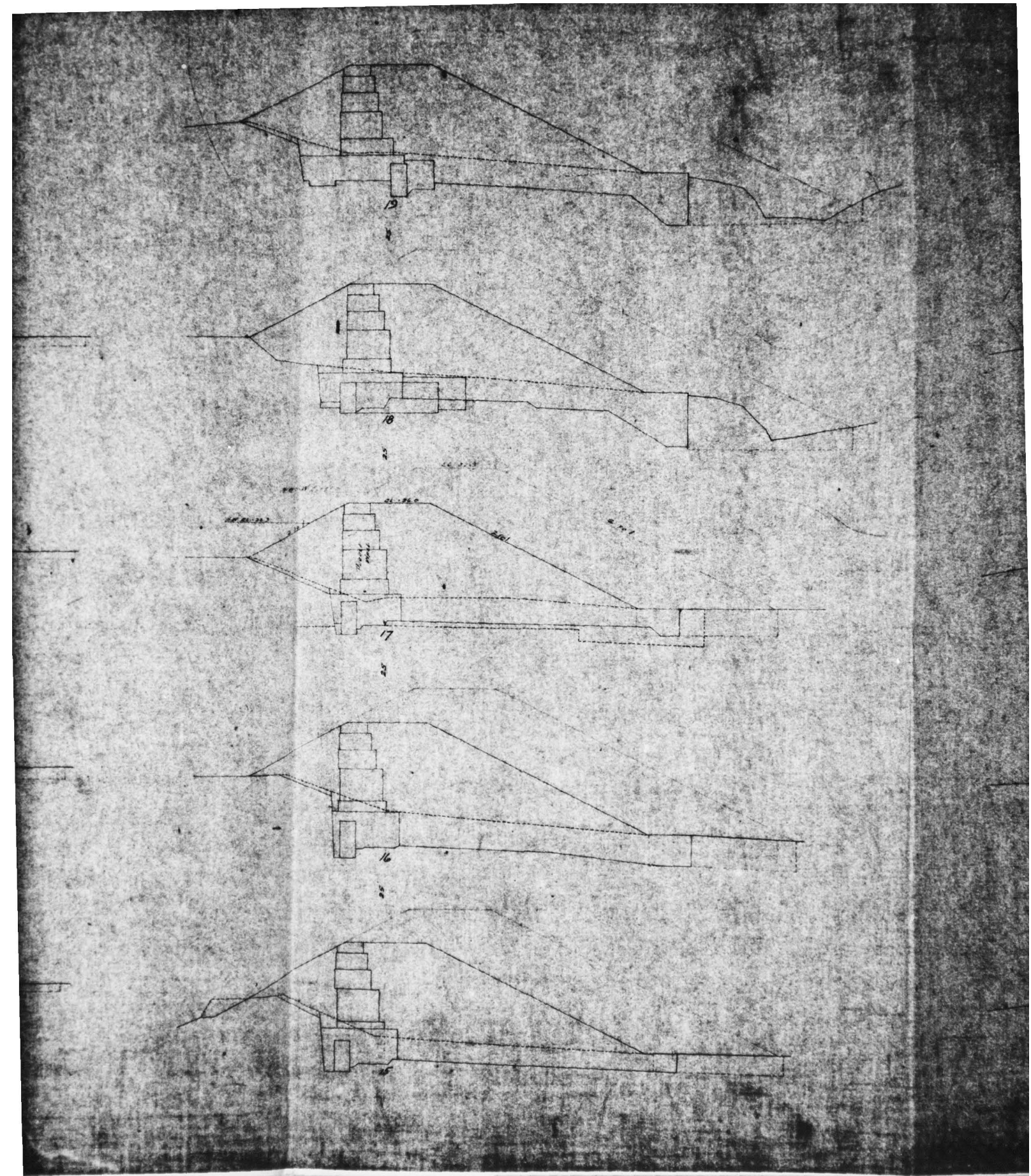
Newburgh, N.Y.

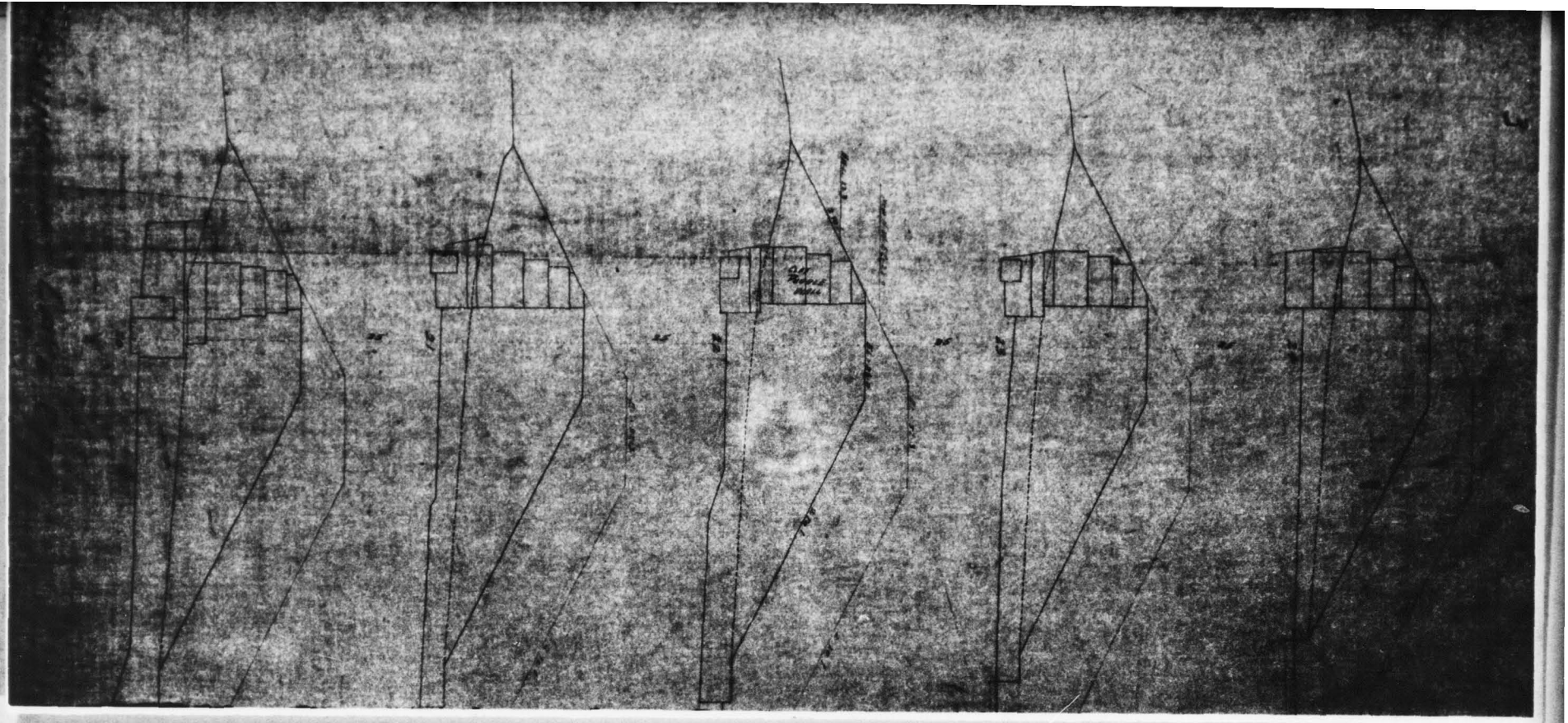
CONTRACT No 1

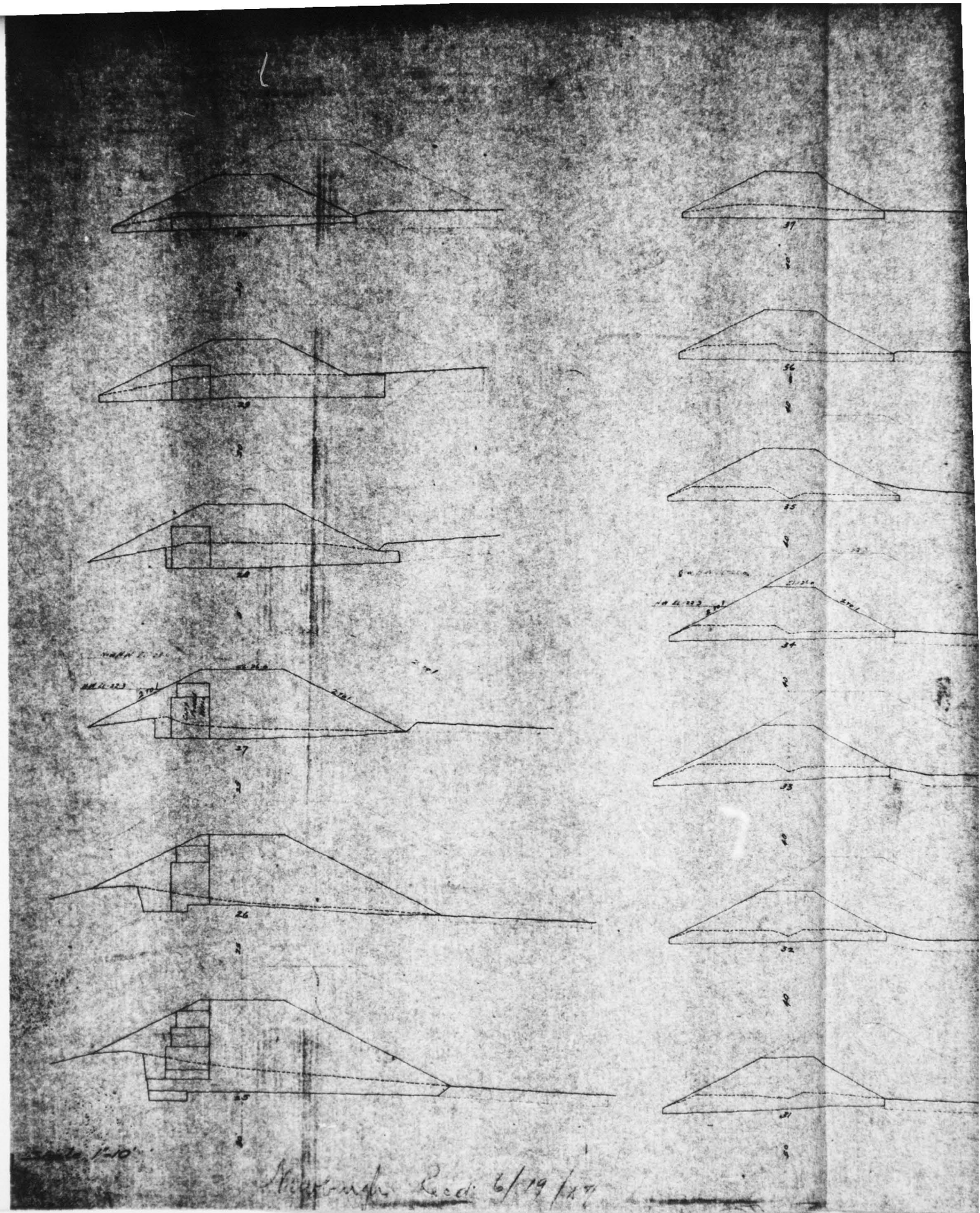
SHEET No 5

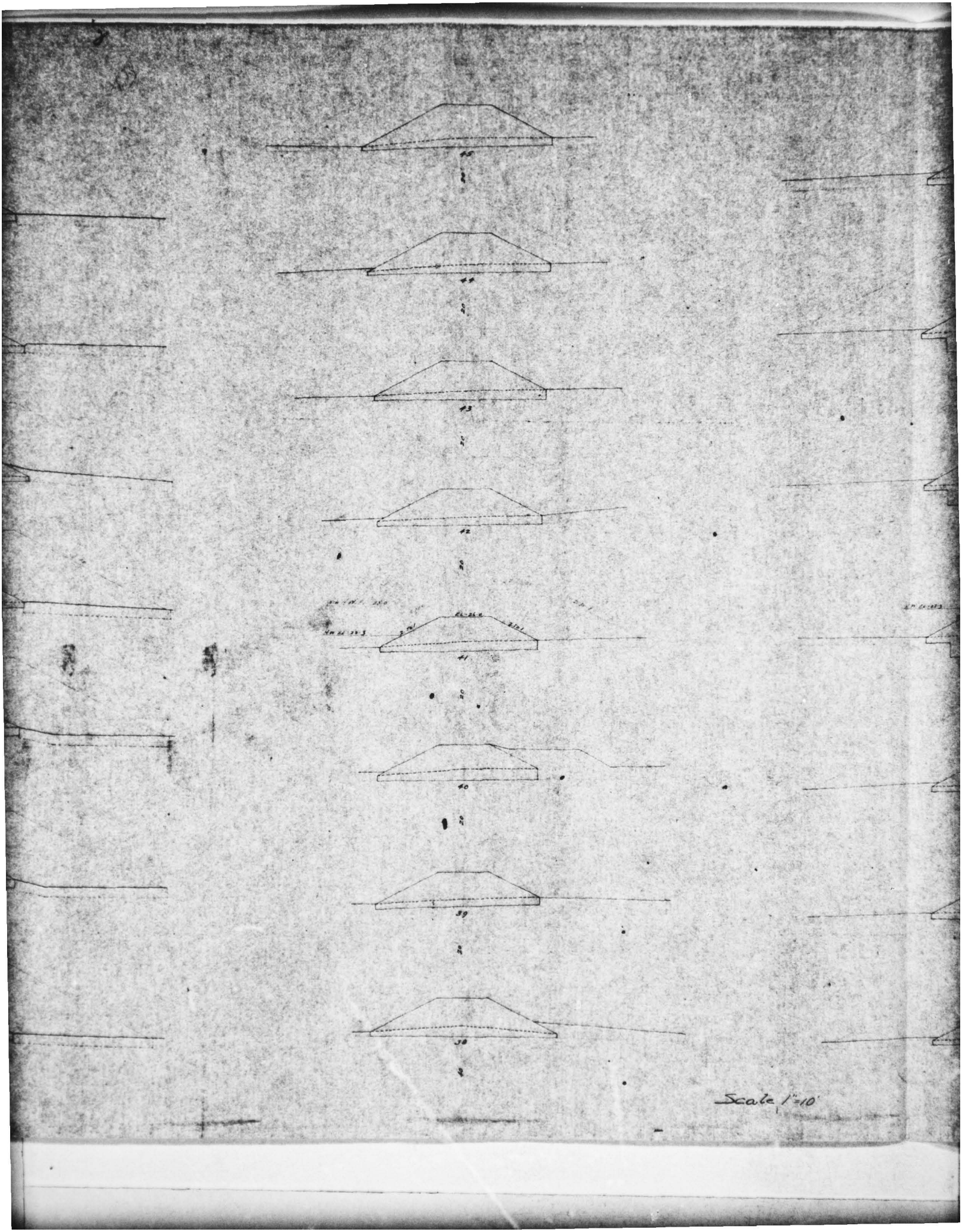

10
9
8
7
6

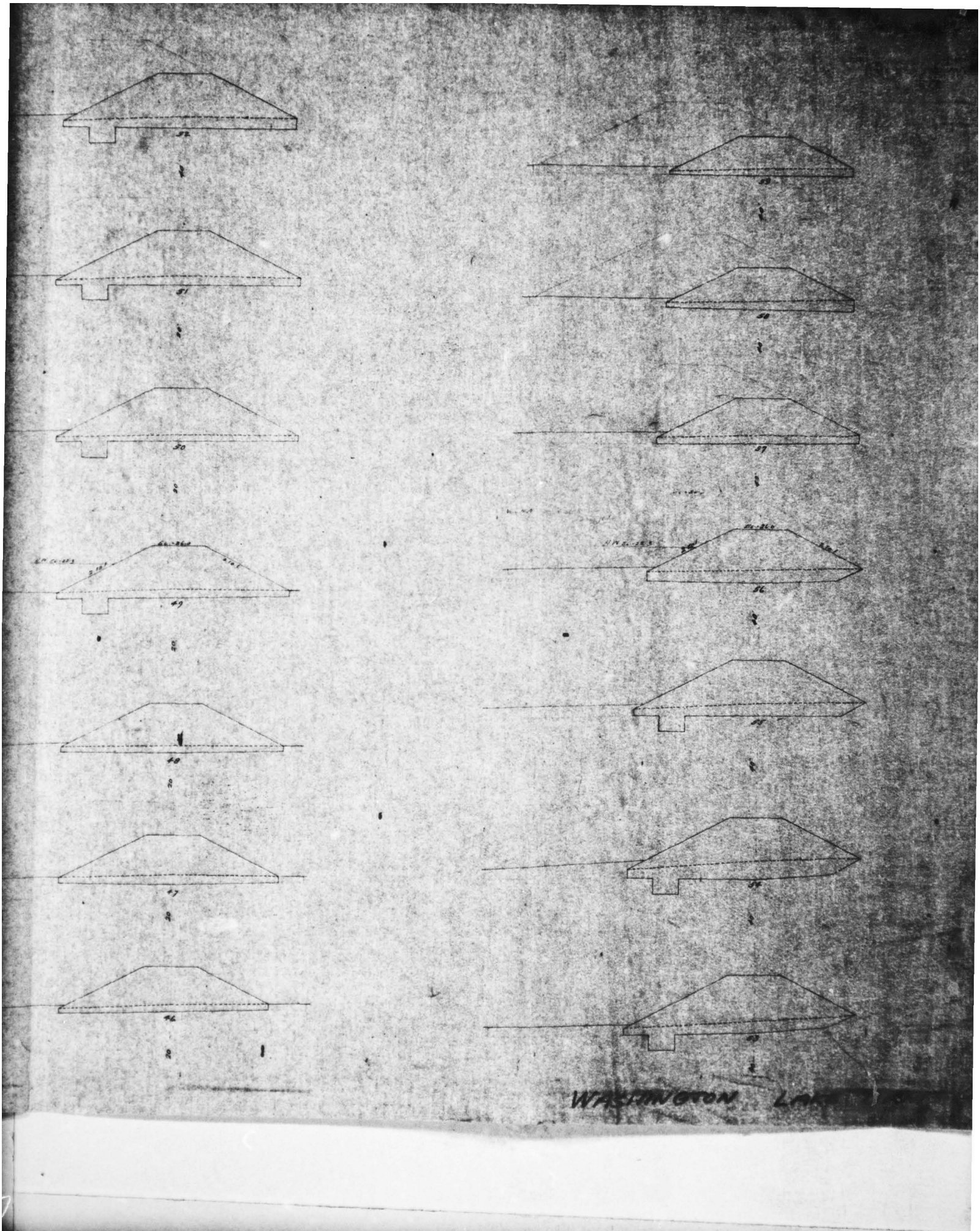



19
18
17
16
15




37
36
35
34
33
32
31
30
29
28
27
26
25
2 to 1
2 to 1


45
44
43
42
41
40
39
38
Scale 1"=10'

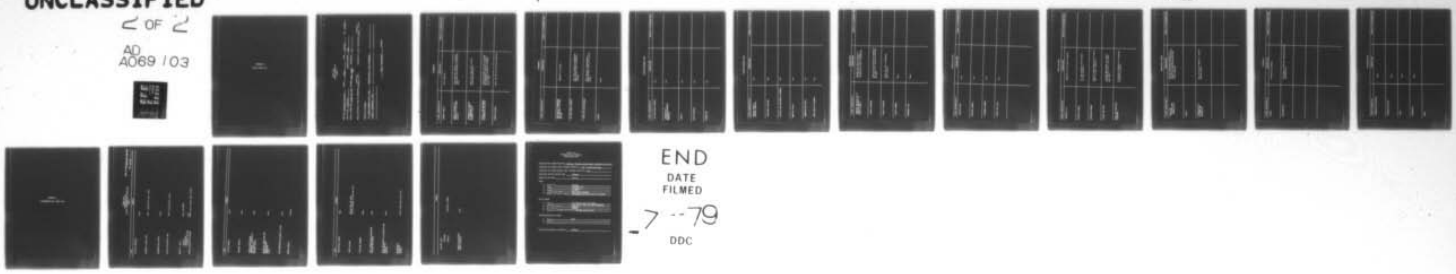

WASHINGTON

AD-A069 103 KIMBALL (L ROBERT) AND ASSOCIATES EBENSBURG PA F/G 13/2
NATIONAL DAM SAFETY PROGRAM. WASHINGTON LAKE DAM (INVENTORY NUM--ETC(U)
SEP 78 R J KIMBALL DACW51-78-C-0025

UNCLASSIFIED NL

2 OF 2

AD A069 103



END

DATE FILMED

7-79

DDC

APPENDIX F

VISUAL CHECK LIST

CHECK LIST
VISUAL INSPECTION
PHASE I

NAME DAM Washington Lake Dam COUNTY Orange STATE New York ID# NY 603

TYPE OF DAM Earthfill HAZARD CATEGORY High

DATE(s) INSPECTION August 28, 1978 WEATHER Warm, cloudy, rain TEMPERATURE 75°

POOL ELEVATION AT TIME OF INSPECTION estimated 299.5 M.S.L. TAILWATER AT TIME OF INSPECTION estimated 291.0 M.S.L.

INSPECTION PERSONNEL:

R. Jeffrey Kimball, P.E. - LRK
Richard Pascoe - City of Newburgh
James T. Hockensmith - LRK

James T. Hockensmith RECORDER

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed, however, very heavy vegetation and tailwater restricted view.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None noted, again heavy growth obscurved observation.	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Appeared alright, but good viewing was impossible. Dam has a history of settling (newspaper clipping July, 1912).	
RIPRAP FAILURES	None. Rip rap in very good condition.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appeared to be good.	
ANY NOTICEABLE SEEPAGE	Very heavy growth on downstream slope caused almost impossible viewing.	
STAFF GAGE AND RECORDER	None, however, superintendent measures water level from a known datum.	
DRAINS	None.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	
STAFF GAGE OF RECORDER:	N/A	

WATER SUPPLY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Conduits for water consist of 24" and 30" cast iron pipes (completed in 1912). Unobserved.	
INTAKE STRUCTURE	Control house located in reservoir. New valves and controls installed in 1974.	
OUTLET STRUCTURE	Flows into City of Newburgh water system.	
OUTLET CHANNEL	None.	
EMERGENCY GATE	None.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Appeared to be in good condition.	
APPROACH CHANNEL	25' long concrete paved channel in good condition.	
DISCHARGE CHANNEL	Concrete paved channel with concrete walls. In good condition.	
BRIDGE AND PIERS	A wooden walk bridge is present over spillway weir - may block some flow.	
GATES AND OPERATION EQUIPMENT	A removable flashboard is installed during drier periods.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No real downstream channel. All drainage is through an underground cavern. All flow eventually goes toward Newburgh.	
SLOPES		
APPROXIMATE NO. OF HOMES AND POPULATION	*Part of City of Newburgh* - several hundred people.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderate and stable.	
SEDIMENTATION	Very minor. Reservoir upstream collects sedimentation.	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER		

APPENDIX G

ENGINEERING DATA CHECK LIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Washington Lake Dam

ID# NY 603

ITEM	REMARKS
AS-BUILT DRAWINGS	None.
REGIONAL VICINITY MAP	1914 - 1915 map of area. Owner
CONSTRUCTION HISTORY	Owner.
TYPICAL SECTIONS OF DAM	1909 cross-sections. Owner
OUTLETS - PLAN	Owner and NYDEC
- DETAILS	
- CONSTRAINTS	
- DISCHANCE RATINGS	None.
RAINFALL/RESERVOIR RECORDS	Water level records kept recently

ITEM	REMARKS
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None.
POST-CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Unknown.

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	Raised 1892 and 1909 Outlets changed in 1909 and 1974.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None.
MAINTENANCE OPERATION RECORDS	Good records kept since 1974.

REMARKS	
SPILLWAY PLAN SECTIONS DETAILS	Drawings at NYDEC
OPERATING EQUIPMENT PLANS & DETAILS	None.

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Natural .69 square miles (Max. diverted 4.93 sq mi)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 301 (6,600 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N/A

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 305.25

CREST:

a. Elevation 30 feet
b. Type Concrete weir
c. Width 14 inches
d. Length 16 feet
e. Location Spillover near right abutment
f. Number and Type of Gates Flashboards can raise level 15 inches

OUTLET WORKS:

a. Type 30" and 24" cast iron pipes
b. Location from intake house through embankment
c. Entrance inverts Unknown
d. Exit inverts Unknown
e. Emergency draindown facilities Through outlet works

HYDROMETEOROLOGICAL GAGES:

a. Type None
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE Unknown